PAGE'S WEEKLY.—June 23, 1905. Thin Paper Copy for Circulation Abroad.

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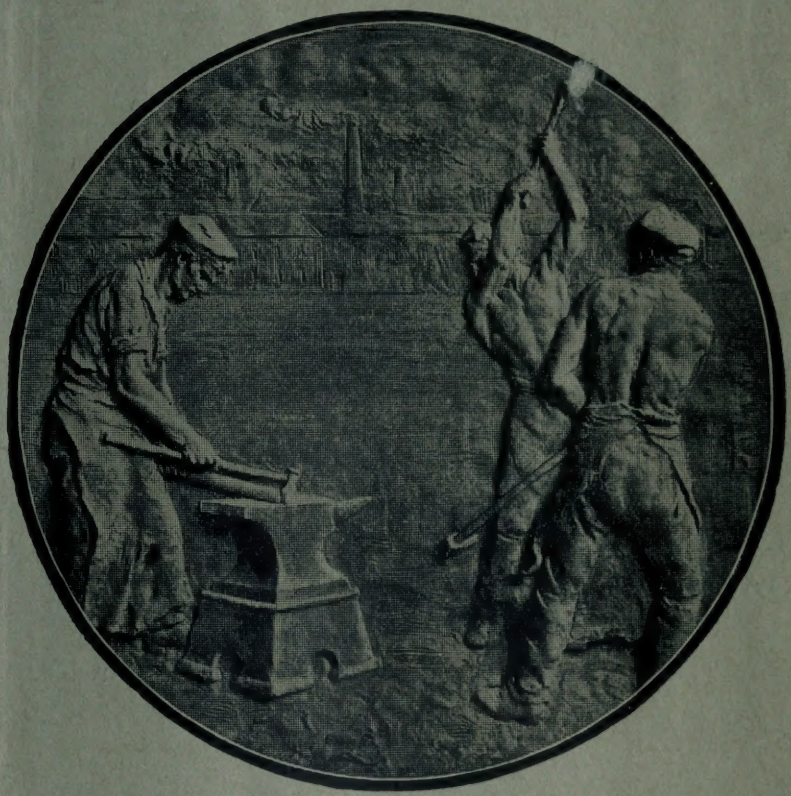
PAGE'S WEEKLY



ENGINEERING · ELECTRICITY SHIPBUILDING MINING IRON & STEEL INDUSTRIES

EDITORIAL & PUBLISHING OFFICES, CLUN HOUSE, SURREY STREET, STRAND, LONDON, W.C.

France, Paris: 22, Rue de la Banque.
Germany, Berlin: 13, Unter den Linden.
Russia, St. Petersburg: 14, Nevsky Prospect.
Italy, Rome: 307 Corso.
Austria, Vienna: Kärntnerstrasse, nr. 30

India, Calcutta: Thacker, Spink & Co.
" Bombay: Thacker & Co., Ltd.
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New Zealand: Gordon & Gotch, Ltd.

Canada: Montreal News Company.
United States, New York: International News Co
" Chicago: Subscription News Co.
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PAGE'S WEEKLY

Miscellaneous

Mr. G. H. HUGHES, M.I.Mech.E.,

Consulting and Organising Engineer for Water Works and Industrial Undertakings,

97, QUEEN VICTORIA ST., LONDON, E.C.

Telephone No.: 5754 Bank. Write for particulars.

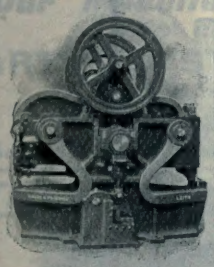
ED. BRAND,

MECHANICAL ENGINEER,
35, SHAKESPEARE STREET, MANCHESTER.

Modern Wire-Working Machinery,

Such as for Rolling, Drawing, Weaving, Netting, Forming, Automatic Straightening and Cutting, Cabling, Testing, &c.

Inquiries Solicited. Teleg. Address: "Filieres, Manchester."



PUNCHING & SHEARING Machines.
STEAM HAMMERS.
Shipbuilders' MACHINE TOOLS.

DAVIS & PRIMROSE,
Leith Ironworks, EDINBURGH.

WEST PASCAGOULA CREOSOTING WORKS,

WEST PASCAGOULA, MISS., U.S.A.

Situated on Pascagoula Bay and on the line of the Louisville and Nashville Railroad. These works have been in operation for more than twenty-six years. ORDERS for Creosoted Piles, Telegraph Poles, Cross Arms, Electric Conduits, Paving Blocks, Sawed Tiles, and Timber PROMPTLY EXECUTED. New cylinders, 115 ft. long. Capacity, one million feet per month. A.B.C. Code used. Cable address: Pierre, West Pascagoula, Miss.—Address, JNO. B. LINDSEY, Superintendent.

GRAHAM, MORTON & Co., LTD.

Head Office and Works, LEEDS.

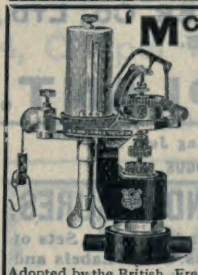
Makers and Erectors of all Classes of
CONVEYING PLANTS, COAL HANDLING PLANTS, AERIAL ROPEWAYS, &c., &c.

PAGE & ROWLINGSON,

Chartered Patent Agents.

Mr. PAGE, who is a Whitworth Exhibitioner and an Associate Member of the Institute of Civil Engineers, has had a large experience as a Practical Mechanical Engineer, and is specially qualified to deal with the most intricate mechanical problems successfully. *Write for Handbook of Information Free.*

28, NEW BRIDGE STREET, LONDON, E.C.,
And 14, St. Ann's Square, Manchester.



'McINNES-DOBBIE' INDICATORS.

In Two types: External and Enclosed Pressure Springs.
Each made in several forms and sizes to suit all speeds and pressures.
Special Indicators for Gas, Winding, and Ammonia Engines, and for Motor-Cars.

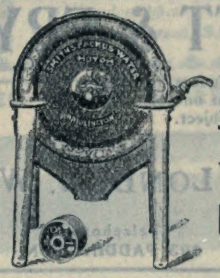
Adopted by the British, French, and Japanese Admiralties.

DOBBIE, McINNES, LIMITED,
45, BOTHWELL ST., GLASGOW.

WAYGOOD LIFTS

APPLY FOR CATALOGUE.

FALMOUTH ROAD, LONDON, S.E.



CHEAP POWER.

SMITH'S

Backus Water Motors

1/16 to 10 H.P.

Will drive any class of Machinery, and work on 15 lb. pressure.

ERIC S. A. SMITH, ENGINEER,
APPLY FOR CATALOGUE. **BRIDLINGTON.**

BABCOCK & WILCOX, Ltd.

PATENT WATER-TUBE BOILERS.

These Boilers are in use throughout the world to the extent of 4,700,000 h.p. generating steam for all purposes, and fired with all kinds of fuel.
See our Advertisement appearing July 7th, page 37.

HEAD OFFICES—Oriel House, Farringdon Street, LONDON, E.C.
WORKS—Renfrew, SCOTLAND.

Standard of the World.
J. H. WILLIAMS & CO.,
Drop-forgings only.
Brooklyn, New York

Rochester Card
Bundy Key
Signature
Journey
Speed
RECORDERS.

For further particulars . . of our . . see our whole page Ad. on July 7th.

TIME RECORDERS

RECORDERS, LTD., 171, Queen Victoria Street, LONDON, E.C.

PAGE'S WEEKLY — Miscellaneous

PAGE'S WEEKLY — Miscellaneous

PAGE'S WEEKLY Contracts

CONTRACTS.

THE METROPOLITAN ASYLUMS BOARD

invite TENDERS for the SUPPLY of BUILDERS', ENGINEERS', SMITHS', PLUMMERS', and GASFITTERS' TOOLS and MISCELLANEOUS IRONMONGERY, ENGINEERING SUPPLIES, and ELECTRIC ACCESSORIES.

Forms of Tender (upon which alone Tenders will be received), giving all particulars, can be obtained at the office of the Board, Embankment, London, E.C., where Tenders, duly filled up, must be delivered not later than 10 a.m. on Wednesday, the 28th June, 1905.

Those whose Tenders are accepted will be informed accordingly in due course.

The Board do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to accept the whole or any part of a Tender.

By order,
T. DUNCOMBE MANN,
Clerk to the Board.

June 8th, 1905.

ILFORD URBAN DISTRICT COUNCIL.

DUST DESTRUCTOR.

The above Council invites TENDERS for the erection of a DUST DESTRUCTOR of Six Cells, viz:—

CELLS, FLUES, DUST CHAMBER, and BOILERS.

Full particulars of the Scheme may be obtained on application to Mr. HERBERT SHAW, A.M.Inst.C.E., Engineer and Surveyor to the Council, at the Town Hall, Ilford, Essex, during the usual office hours, on payment of a deposit of £5 5s., which will be returned on receipt by the Council of a *bona fide* Tender.

Sealed Tenders, endorsed "Tender for Dust Destructor" are to be addressed and sent to the undersigned here on or before noon on Monday, the 26th day of June, 1905.

The Council does not bind itself to accept the lowest or any Tender.

JOHN W. BENTON,
Clerk to the Council.

Town Hall, Ilford, Essex,
June 5th, 1905.

TO ENGINEERS AND OTHERS.

The METROPOLITAN ASYLUMS BOARD invite TENDERS for ALTERATIONS to ENGINEERING ARRANGEMENTS, etc., in LAUNDRY at the SOUTH-EASTERN HOSPITAL, New Cross, S.E., in accordance with Drawings and Specification prepared by Mr. W. T. HATCH, M.I.C.E., M.I.M.E., Engineer-in-Chief.

Drawings, Specification, Conditions of Contract, and Form of Tender may be inspected at the Office of the Board, Embankment, E.C., on and after June 19th, 1905, and can then be obtained upon payment of a deposit of £2, but applications for same will not be entertained after Saturday, July 1st, 1905.

The amount of the deposit will be returned only to persons who have sent in *bonâ fide* Tenders and returned Drawings and Specification in accordance with the regulations.

Tenders, addressed as noted on the form, must be delivered at the Office of the Board not later than 10 a.m. on Tuesday, July 11th, 1905.

By order,
T. DUNCOMBE MANN,
Clerk to the Board.

June 10th, 1905.

METROPOLITAN WATER BOARD.—

TENDERS for the SUPPLY of about 450 TONS of 42-in., 30-in., and other PIPES and CASTINGS.

The Metropolitan Water Board invite TENDERS for the SUPPLY of CAST-IRON PIPES and other CASTINGS, to be delivered at Cricklewood, in the County of Middlesex.

The Forms of Tender and Contract, with Specification and Schedule, may be obtained, and the drawings inspected, on application at the Office of the Board, The Firs, Southern Road, Fortis Green, East Finchley, between the hours of 10 and 4 (except on Saturdays), on and after Thursday, the 22nd instant, on production of an official receipt for the sum of ten guineas, which must first be deposited with the Comptroller at the Board's Central Offices, Savoy Court, Strand, W.C., which sum will be returned after the receipt of a *bona fide* Tender.

Tenders, endorsed "Cricklewood Pipes," enclosed in sealed envelopes, addressed to the undersigned, must be delivered at the above-named Central Offices, not later than 12 noon on the 7th July, 1905.

A. B. PILLING,
Clerk of the Board.

COUNTY OF LONDON.—TO ELECTRICAL ENGINEERS AND OTHERS.

The LONDON COUNTY COUNCIL invites TENDERS for the SUPPLY, DELIVERY, and ERECTION of FOUR SETS of HIGH-TENSION FEEDER and HIGH and LOW TENSION MACHINE SWITCHGEAR for its Tramway Sub-Stations at Battersea, Clapham, Streatham, and Wandsworth.

Persons desiring to submit Tenders may obtain the Specification, Drawings, Form of Tender, and other particulars at the County Hall, Spring Gardens, S.W., on payment to the Cashier of the Council of the sum of £2. This amount will, after the Council or its Committee have come to a decision upon the Tenders received, but not before, be returned to the Tenderer provided he shall have sent in a *bona fide* Tender and not have withdrawn the same, but in no case will the fee be returned unless a *bona fide* Tender is submitted.

Full particulars of the work may be obtained on application at the County Hall previously to the payment of the fee for Specification, etc.

Tenders must be upon the official forms, and the printed instructions contained therein must be strictly complied with.

The Contractors will be bound by the contract to pay all workmen (except a reasonable number of legally bound apprentices) employed by them wages at rates not less and to observe hours of labour not greater than the rates and hours set out in the Council's list, and such rates of wages and hours of labour will be inserted in and form part of the contract by way of schedule.

Each Tender is to be delivered at the County Hall, in a sealed cover, addressed to the Clerk of the London County Council, Spring Gardens, S.W., and marked "Tender for High and Low Tension Sub-Station Switchgear."

No Tender will be received after 10 a.m. on Tuesday, the 11th day of July, 1905. Any Tender which does not comply with the printed instructions for Tender may be rejected.

The Council does not bind itself to accept the lowest or any Tender, and it will not accept the Tender of any person or firm who shall on any previous occasion have withdrawn a Tender after the same had been opened unless the reasons for the withdrawal were satisfactory to the Council.

G. L. GOMME,
Clerk of the London County Council.

County Hall, Spring Gardens, S.W., June 16th, 1905.

BOROUGH OF NELSON.—SEWAGE WORKS.

The SEWAGE and STREETS COMMITTEE are prepared to receive TENDERS for the SUPPLY and ERECTION of a SUCTION GAS PLANT and ENGINE at the Sewage Works.

Particulars may be had on application at the Office of Mr. B. BALL, A.M.Inst.C.E., Borough Engineer and Surveyor.

Tenders, endorsed "Suction Gas Plant," to be sent to the undersigned by first post on Saturday, the 8th July, 1905.

The Committee do not bind themselves to accept the lowest or any Tender.

J. H. BALDWICK,
Town Clerk.

Town Hall, Nelson,
June 9th, 1905.

COUNTY BOROUGH of SOUTHAMPTON.

WEIGHBRIDGES.

The CORPORATION of SOUTHAMPTON invite TENDERS for SUPPLYING and FIXING THREE WEIGHBRIDGES at their Depots.

A Specification may be inspected and further particulars obtained upon application to Mr. J. A. CROWTHER, Borough Engineer.

Tenders, endorsed "Tender for Weighbridges," must be left at the Town Clerk's Office before 2 p.m. on the 27th instant.

No pledge is given to accept the lowest or any tender.

By order,
R. R. LINTHORNE,
Town Clerk.

Town Clerk's Office,
Municipal Offices, Southampton,
June 2nd, 1905.

VICTORIAN RAILWAYS.

TENDERS are invited for the MANUFACTURE, SUPPLY, and DELIVERY of STEEL RAILS and FISHPLATES.

Tenders, accompanied by the preliminary deposit of £250, must be lodged in the tender box at the Railway Offices, Melbourne, Victoria, Australia, or at the Office of the AGENT-GENERAL FOR VICTORIA, 142, Queen Victoria Street, London, E.C., before 1 p.m., Monday, the 7th August.

Specifications and Drawings will be available at the Agent-General's Office on the 18th June.

PAGE'S WEEKLY Contracts

METROPOLITAN BOROUGH OF SHOREDITCH.

ELECTRICITY SUPPLY DEPARTMENT.

The MAYOR, ALDERMEN, and COUNCILLORS of the Metropolitan Borough of Shoreditch require TENDERS for the EXTENSION of PLANT at their Whiston Street Generating Station.

The requirements include—

Two 1,500 kw. Steam Turbo-Generators.
Condensers, Pumps, Piping, etc.

Specification, drawings, and general conditions may be obtained on and after Tuesday, the 20th instant, at the offices of the Borough Electrical Engineer, Coronet Street, N., on payment, by cheque, of £5, which will be refunded on the receipt of a *bonâ fide* Tender. The fee will not, however, be returned until the whole of the Tenders received have been finally considered.

Tenders, sealed and endorsed (on the left-hand corner of envelope) "Tenders for Turbo-Generators," should be addressed to the Town Clerk, Town Hall, Old Street, E.C., and must be delivered not later than noon of the 18th day of July.

The Council does not bind itself to accept the lowest or any Tender.

H. M. ROBINSON, LL.D.,
Town Clerk.

Town Hall, Shoreditch.

ABERDEEN HARBOUR.—DOCK RAILWAYS.

The Aberdeen Harbour Commissioners are prepared to receive TENDERS for the following PERMANENT-WAY MATERIALS, viz :—

(1) Steel Rails and Guard Rails.
(2) Steel Fishplates.
(3) Steel Fishbolts and Rail Clips.

Copies of the specification, conditions of contract, and form of Tender may be obtained from the undersigned on payment of Ten Shillings for each contract, which sum will be returned to *bonâ fide* offerers.

Endorsed Tenders are to be lodged with the undersigned not later than 12 o'clock noon on Monday, June 26th, 1905.

R. GORDON NICOL,
Engineer.

Harbour Engineer's Office, Aberdeen,
June 9th, 1905.

EAST INDIAN RAILWAY.—The East Indian Railway Company is prepared to receive TENDERS for the SUPPLY and DELIVERY of—

(1) SPRING STEEL,
(2) GALVANISED STEEL WIRE,

as per specifications to be seen at the Company's offices.

Tenders are to be sent to the undersigned, marked "Tender for Spring Steel," or as the case may be, not later than Twelve noon on Wednesday, the 28th day of June instant.

The Company reserves to itself the right to divide the order, also to decline any Tender without assigning a reason, and does not bind itself to accept the lowest or any Tender.

Fees, which cannot under any circumstances be returned, are charged for the specification as under, viz. :—

For No. 1, 21s.; and for No. 2, 10s. 6d.

By order,
C. W. YOUNG,
Secretary.

Nicholas Lane, London, E.C.,
June 15th, 1905.

GREAT WESTERN RAILWAY.

ELECTRIC POWER AND LIGHTING.

The DIRECTORS of this Company are prepared to receive TENDERS for the SUPPLY, DELIVERY, and ERECTION of the FOLLOWING PLANT in connection with their Electricity Generating Station at Park Royal :—

SPECIFICATION 18.—Pipework, Feed and other Pumps, Tanks, Feed Heaters, Water-Softening and Oil-Separating Plant, &c.

Copies of the Specification, Form of Tender, Drawings, and General Conditions can be obtained on and after Monday, the 5th instant, at the Offices of the Consulting Engineers, Messrs. KENNEDY AND JENKIN, 17, Victoria Street, London, S.W., between the hours of 10 a.m. and 4 p.m., on payment of Two Guineas for each Specification, which will be refunded on receipt of a *bona fide* Tender. The fee, which must be paid by cheque, will not be returnable until the Tenders have been adjudicated upon.

Tenders, addressed to "The Secretary, Great Western Railway, Paddington Station, W.," and marked outside "Tender for Pipework, &c., Specification No. 18," will be received not later than 10 a.m. on Monday, June 26th.

The Directors do not bind themselves to accept the lowest or any Tender, and no allowance will be made for any expense incurred in the preparation of a Tender.

G. K. MILLS,
Secretary.

Paddington Station, London,
June, 1st 1905.

BOROUGH OF LEIGH, LANCS.

TENDERS are invited for the SUPPLY of ONE WATER-TUBE BOILER for the Electricity Department.

Specifications and General Conditions may be obtained on application to the Electrical Engineer, Mr. ARTHUR T. SMITH, on payment of One Pound, which sum will be refunded on receipt of a *bona fide* Tender.

Tenders to be delivered at the Town Hall, Leigh, Lancs., addressed to the Town Clerk, not later than Saturday, July 1st, 1905, endorsed "Tender for Water-Tube Boiler."

By order,
STANLEY WILSON,
Town Clerk.

Town Hall, Leigh, Lancs.,
June 7th, 1905.

APPOINTMENTS OPEN.

ASSISTANT CIVIL ENGINEERS IN THE DEPARTMENT OF THE DIRECTOR OF ENGINEERING, &c., ADMIRALTY, AT HEAD OFFICE AND OUTPORTS (23-28).—An OPEN COMPETITIVE EXAMINATION will be HELD in JULY, 1905. Technical training and qualifications necessary.

Applications must be received at the Civil Service Commission not later than June 28th, on printed forms to be obtained, with particulars, from the SECRETARY, Civil Service Commission, Burlington Gardens, London, W.

COUNTY OF LONDON.—THE LONDON COUNTY COUNCIL invites APPLICATIONS from fully competent ENGINEERS with good experience in the design and construction of the PERMANENT WAY and general arrangement of ELECTRIC TRAMWAYS on the conduit system (if possible) and on the overhead system.

Candidates must be good surveyors, levellers, and draughtsmen, and able to prepare working drawings, specifications, quantities, and estimates, and to assist in supervising such work done by other assistants.

The rate of pay will be £7 a week, and applications will only be considered from persons with good previous experience in the class of work involved.

The appointment will be in the first instance of a temporary nature, but with the prospect, at the expiration of about six months, of being made permanent, subject to the usual conditions attaching to appointments under the Council, should the work have been carried out in a satisfactory manner during that time.

Applications, giving full particulars as to age, qualifications, and experience, and enclosing copies of testimonials, must be made on forms, which may be obtained from the Clerk of the Council, County Hall, Spring Gardens, S.W., on and after Monday, June 5th, 1905.

The latest time for receiving applications, which must be addressed to the Clerk of the Council at the above address, is 10 a.m. on Tuesday, June 27th, 1905.

G. L. GOMME,
Clerk of the London County Council.

County Hall, Spring Gardens,
June 1st, 1905.

CORPORATION OF DURBAN, NATAL.

APPLICATIONS are invited from Engineers to fill the post of BOILER SUPERINTENDENT in the Corporation Electric Power Station. The candidate must have had charge of a large installation of boilers, not under 5,000 horse power, in a central electric works, and must be thoroughly experienced in the construction of water-tube boilers. He should have had experience of mechanical stokers, and preference will be given to one who has been accustomed to working with a CO_2 tester.

The successful applicant will be placed in entire charge of a large battery of boilers under the direction of the chief works engineer. Salary offered is from £250 to £300 a year, depending upon the qualifications which can be shown.

Applications, endorsed "Durban Boiler Superintendent," stating age and experience, together with copies (not originals) of not more than three recent testimonials, to be delivered to the undersigned on or before Tuesday, July 4th, 1905.

WEBSTER, STEEL, AND CO.,
Agents to the Corporation of Durban.

5, East India Avenue, London, E.C., June 15th, 1905.

THE UNIVERSITY OF LIVERPOOL.

The Council invite APPLICATIONS for the VACANT CHAIR of ENGINEERING.

The income of the Chair consists of a fixed stipend and share of fees, and is guaranteed at not less than £900 per annum for five years.

Applications, with references and (if the candidate desires) testimonials, are requested not later than June 21st.

Further particulars on application to the Registrar.

BUYERS' DIRECTORY.

NOTE.—*The display advertisements of the firms mentioned under each heading can be found readily by reference to the Alphabetical Index to Advertisers on pages 23 and 25.*

In order to assure fair treatment to advertisers, each firm is indexed under its leading speciality ONLY.

Advertisers who prefer, however, to be entered under two or more different sections can do so by an annual payment of 5s. for each additional section.

Artesian Well Machinery.
John Z. Thom, Patricroft, Manchester.

Belting.
Binney & Son, Catherine Street, City Road, London, E.C.
Cort, Arthur, & Co., Camberwell, London, S.E.
Fleming, Birkby & Goodall, Ltd., West Grove, Halifax.
Gilmour, W. & O., St. John's Hill, Edinburgh.

Boilers.
Clayton, Son & Co., Ltd., Leeds City Boiler Works, Leeds.
Grantham Crank & Iron Co., Ltd., Grantham.
Hartley & Sugden, Ltd., Halifax.

Boilers (Water-tube).
Babcock & Wilcox, Ltd., Oriel House, Farringdon Street, London, E.C.
Stirling Boiler Co., Ltd., Motherwell, N.B.

Bolts, Nuts, Rivets, etc.
Herbert W. Periam, Ltd., Floodgate Street Works, Birmingham.
T. D. Robinson & Co., Ltd., Derby.

Books.
Crosby Lockwood & Son, Stationers' Hall Court, London, E.C.
Griffin, Charles, & Co., Exeter Street, Strand, W.C.
New Zealand Mines Record, Wellington, New Zealand.
Spon, E. & F. N., 125, Strand, W.C.
World's Work and Play.

Boring Machines.
Asquith, William, Ltd., Well Road Works, Halifax.

Case-Hardening Compounds.
Hy. Miller & Co., Milligarth Works, Leeds.

Castings
Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.

Catalogues, Printing, &c.
Atlantic Press, Ltd., Weymouth Street, Manchester.
Southwood, Smith & Co., Ltd., Plough Court, Fetter Lane, London, E.C.
Spottiswoode Advertising Agency, Clun House, Surrey Street, Strand, W.C.
Stafford, Arthur, & Co., Denton, Manchester.

Chucks.
Fairbanks Co., 78-80, City Road, London, E.C.

Cisterns, Tanks, &c.
Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.
F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Clutches (Friction).
David Bridge & Co., Castleton Ironworks, Rochdale, Lancashire.

Colliery Plants.
Graham, Morton & Co., Ltd., Leeds.

Condensing Plant.
Benn, Sykes, Haslingden, near Manchester.
Concentric Condenser, Ltd., 23, Northumberland Avenue, London, W.C.
Mirrlees-Watson & Co., Ltd., Glasgow.

Consulting Engineers.
Gibbs, John, & Son, 80, Juke Street, Liverpool.
G. H. Hughes, A.M.I.M.E., 97, Queen Victoria Street, London, E.C.
Melville & Macalpine, 615, Walnut Street, Philadelphia, Pa., U.S.A.

Continental Railway Arrangements.
Northern Railway of France.
South Eastern & Chatham Railway Co.

Conveying and Elevating Machinery.
Adolf Bleichert & Co., Leipzig-Gohlis, Germany.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
Graham, Morton & Co., Ltd., Leeds.
Temperley Transporter Co., 72, Bishopsgate Street Within, London, E.C.

Coverings (Boiler).
Magnesia Coverings, Ltd., Washington Station, co. Durham.

Cranes, Travellers, Winches, etc.
Joseph Booth & Bros. Ltd, Rodley, Leeds.
Thomas Broadbent & Sons, Ltd., Huddersfield.
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.

Cranks.
Clarke's Crank & Forge Co., Ltd., Lincoln, England.

Cutters (Milling).
E. G. Wrigley & Co., Ltd., Foundry Lane Works, Soho, Birmingham.

Destructors.
Heenan & Froude, 4, Chapel Walks, Manchester.
Horsfall Destructor Co., Ltd., Armley, Leeds.

Dredges and Excavators.
Delange & Cie, Mce., Hoboken, near Antwerp.
Rose, Downs & Thompson, Ltd., Old Foundry, Hull.

Drilling Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Swift, George, Claremont Ironworks, Halifax.

Economisers.
E. Green & Son Ltd., Manchester.

Ejectors (Pneumatic).
Hughes & Lancaster, 47, Victoria Street, London, S.W.

Electrical Apparatus.
Allgemeine Elektricitäts Gesellschaft, Berlin, Germany.
Broadbent, T. W., Victoria Electrical Works, Huddersfield.
Crypto Electrical Co., 3, Tyer's Gateway, Bermondsey Street, London, S.E.
Gent & Co., Ltd., Faraday Works, Leicester.
Greenwood & Batley, Ltd., Albion Works, Leeds.
India Rubber, Gutta Percha, and Telegraph Works Co., Ltd., Silvertown, London, E.
Mather & Platt, Ltd., Salford Iron Works, Manchester.
Matthews & Yates, Ltd., Swinton, Manchester.
Mix and Genest, Berlin, W., Germany.
Nalder Bros. & Thompson, 34, Queen Street, London, E.C.
New Gutta Percha Co., Ltd., Dashwood House, New Broad Street, E.C.
Newton Brothers, Full Street, Derby.
Phœnix Dynamo Manufacturing Co., Bradford, Yorks.
Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.
Turner, Atherton & Co., Ltd., Denton, Manchester.
B. Weaver & Co., 22, Rosoman Street, Clerkenwell, London, E.C.

Engineers' Supplies.
Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.

Engines (Gas).
Campbell Gas Engine Co., Ltd., Halifax
Soest, L., & Co., Ltd., 114-116, Victoria Street, London, S.W.

Engines (Electric Lighting).
McLaren, J. and H., Midland Engine Works, Leeds.

Engines (Locomotive).
Baldwin Locomotive Works, Philadelphia, Pa., U.S.A.
Hunslet Engine Co., Ltd., Leeds, England.
Hudswell, Clarke & Co., Ltd., Leeds, England.
McLaren, J. & H., Midland Engine Works, Leeds.

Engines (Portable).
Garrett, R., & Sons, Leiston, R.S.O., Suffolk.

Engines (Stationary).
Allis-Chalmers Co., 533, Salisbury House, Finsbury Circus, London, E.C.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
Garrett, R., & Sons, Leiston, R.S.O., Suffolk.
Mirrlees Watson Co., Ltd., Glasgow.

Engines (Traction).
Jno. Fowler & Co. (Leeds), Ltd., Steam Plough Works, Leeds.
Garrett & Sons, Ltd., Richard, Leiston, R.S.O., Suffolk.

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Jno. Swain & Son, Ltd., 58, Farringdon Street, London, E.C.

Exhaust Steam Oil Separators.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

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Capel Fan Co., 13, Moseley Street, Newcastle-on-Tyne.
Davidson & Co., Ltd., "Sirocco" Engineering Works, Belfast, Ireland.
Gibbs, John & Son, 80, Juke Street, Liverpool.
James Keith & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.
Matthews & Yates, Ltd., Swinton, Manchester.

Fire Bricks.
J. H. Sankey & Son, Ltd., Essex Wharf, Canning Town London, E.

Buyers' Directory—(*Continued*).

Firewood Machinery.
M. Glover & Co., Patentees and Saw Mill Engineers, Leeds.

Fountain Pens.
Mabie, Todd & Bard, 93, Cheapside, London, E.C.

Forging (Drop) Plants.
Brett's Patent Lifter Co., Ltd., Coventry.

Forgings (Drop).
J. H. Williams & Co., Brooklyn, New York, U.S.A.

Furnaces.
Deighton's Patent Flue & Tube Company, Vulcan Works, Pepper Road, Leeds.
Leeds Forge Co., Ltd., Leeds.
W. F. Mason, Ltd., Engineers, Manchester.

Gas Producers.
Graham, Morton & Co., Ltd., Leeds.
W. F. Mason, Ltd., Engineers, Manchester.

Gauge Glasses.
J. B. Treasure & Co., Vauxhall Road, Liverpool.
Tomey, J., & Sons, Aston, Birmingham.

Gauges (Pressure, Vacuum, and Hydraulic).
Dobbie, McInnes, Ltd., 45, Bothwell Street, Glasgow.

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Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.
Asquith, William, Ltd., Well Road Works, Halifax.
Reid Gear Co., Linwood, near Glasgow.
Wild, M. B., & Co., Corporation Street, Birmingham.

Gold Dredging Plant.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.

Greases.
Blumann and Stern, Ltd., Plough Bridge, Deptford, London, S.E.

Hack Saws.
Baynes, Charles, Knuzden Brook, Blackburn.

Hammers (Steam).
Davis & Primrose, Leith Ironworks, Edinburgh.
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.

Hoisting Machinery.
See Conveying Machinery.

Horizontal Boring Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Greenwood & Batley, Albion Works, Leeds.
Niles-Bement Pond Co., 23-25, Victoria Street London, S.W.

Hydraulic Leather.
Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.

Hydraulic Machine Tools.
Vauxhall and West Hydraulic Engineering Co. Ltd., 23, College Hill, London, E.C.

Icemaking and Refrigerating Machinery.
H. J. West & Co., 114-118, Southwark Bridge Road, London, S.E.

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Dobbie McInnes, Ltd., 45, Bothwell Street, Glasgow.
Hannan & Buchanan, 75, Robertson Street, Glasgow.

Iron and Steel.
Imperial Steel Works, Sheffield.
Allen, Edgar, & Co. Ltd.
Askham Bros. & Wilson, Ltd., Sheffield.
Consett Iron Co., Ltd., Consett, Durham, and Newcastle-on-Tyne.
Fairley & Sons, James, Old Mint, Shadwell Street, Birmingham.
Farnley Iron Co., Ltd., Leeds, England.
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Walter Scott, Ltd., Leeds Steel Works, Leeds, England.
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Northern Engineering Co. (1900) Ltd., King Cross, near Halifax.
Swift, George, Claremont Ironworks, Halifax.

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Williams, J. H., & Co., Brooklyn New York, U.S.A.

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Matthew Wells & Co., Hardman Street Oil Works, Manchester.

Machine Tools.
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George Addy & Co., Waverley Works, Sheffield.
Bateman's Machine Tool Co., Hunslet, Leeds.
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Bradbury & Co., Ltd., Wellington Works, Oldham.
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Cunliffe & Croom, Ltd., Broughton Ironworks, Manchester.
Dean, Smith & Grace, Ltd., Keighley.
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John Lang & Sons, Johnstone, near Glasgow.
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Mitchell, D., & Co., Ltd., Central Ironworks, Lawkholme, Keighley.
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Swift, George, Claremont Ironworks, Halifax.
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T. W. Ward, Albion Works, Sheffield.
West Hydraulic Engineering Co. (see Vauxhall and West Hydraulic Engineering Co. Ltd.), 23, College Hill, London, E.C.
Winn, Charles, & Co., St. Thomas Works, Birmingham.
Yorkshire Machine Tool and Engineering Works, Liversedge, Yorks.

Marks.
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Metals.
Delta Metal Co., Ltd., East Greenwich, London, S.E.
Magnolia Anti-Friction Metal Co., Ltd., of Great Britain, 49, Queen Victoria Street, London, E.C.
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Lancaster & Tonge, Ltd., Pendleton, Manchester.
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United States Metallic Packing Co., Ltd., Bradford.
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Paper.
Lepard & Smiths, Ltd., 29, King Street, Covent Garden, London, W.C.

Patent Agents.
Page & Rowlingson, 28, New Bridge Street, London, E.C.

PAGE'S WEEKLY

Miscellaneous

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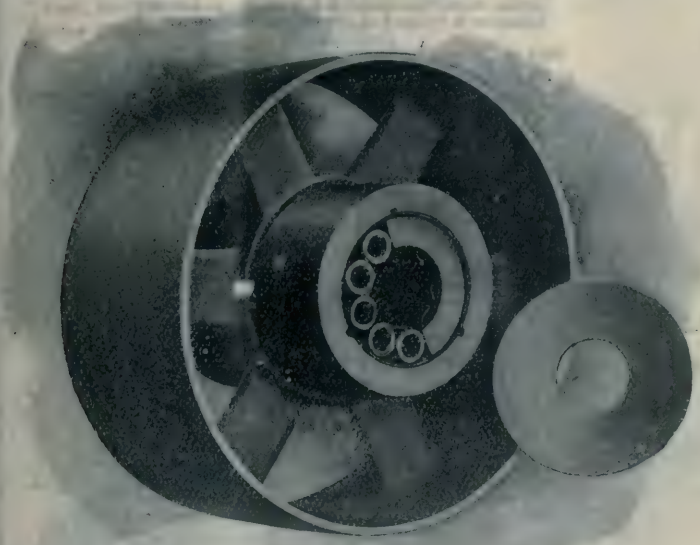

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Publishers.

Crosby Lockwood & Son, 7, Stationers' Hall Court, London, E.C.
Charles Griffin & Co., Ltd., Exeter Street, Strand, London, W.C.
Spon, E. and F. N., 125, Strand, W.C.
New Zealand Mines Record, Wellington, New Zealand.

Pumps and Pumping Machinery.

Drum Engineering Co., 27, Charles Street, Bradford.
Enke, Carl, Schkeuditz-Leipzig, Germany.
Fairbanks, Morse & Co., 126, Southwark Street, London, S.E.
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J. P. Hall & Sons, Ltd., Peterborough.
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Greenwood & Batley, Albion Works, Leeds.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Northern Engineering Co. (1900), Ltd., King Cross, near Halifax.
Swift, George, Claremont Ironworks, Halifax.

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Graham, Morton & Co., Ltd., Leeds.
Head, Wrightson & Co., Ltd., Thornaby-on-Tees.

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Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.

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Cambridge Scientific Instrument Co., Ltd. Cambridge.

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Rubber Stamp Co., 1 & 2, Holborn Buildings, Broad Street Corner, Birmingham.

Stamps (Metal).

Edward Pryor & Son, 68, West Street, Sheffield.

Steam Traps.

British Steam Specialties, Ltd., Fleet Street, Leicester.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

Steam Wagons.

Thornycroft & Co., Ltd., J. I., Chiswick, London, W.
Yorkshire Patent Steam Wagon Co., Pepper Road, Hunslet, Leeds.

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Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.

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Tubes, Ltd., Birmingham.

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S. Howes, 64, Mark Lane, London, E.C.

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Empire Typewriter Co., 77, Queen Victoria Street, London, E.C.
Yost Typewriter Co., 50, Holborn Viaduct, London, E.C.

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Winn, Charles, & Co., St. Thomas Works, Birmingham.

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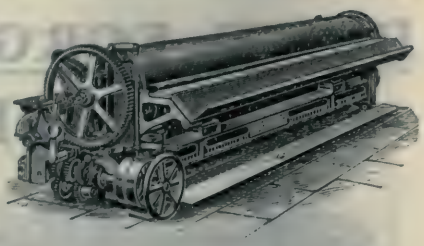

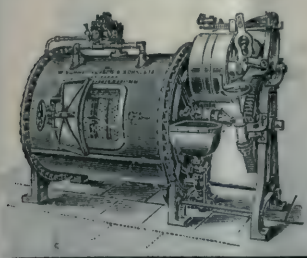

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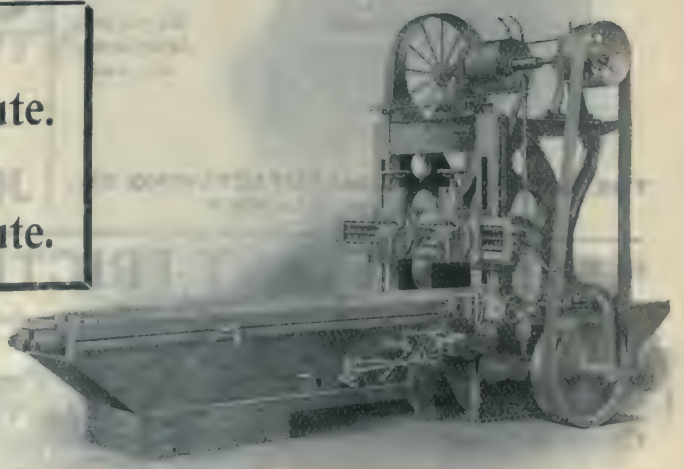

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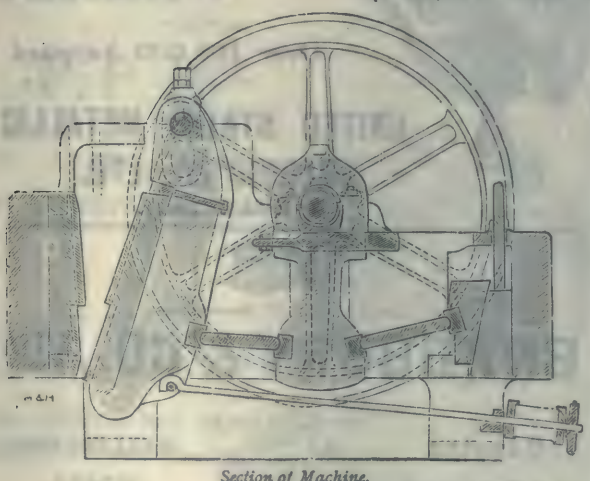

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PAGE'S WEEKLY — Miscellaneous

Index to Advertisers.

Advertisements not appearing this week will be found by reference to the preceding or following issues, with the exception of those appearing monthly.

PAGE'S WEEKLY — Miscellaneous

Index to Advertisers—(Contd.)

PAGE'S WEEKLY

Miscellaneous

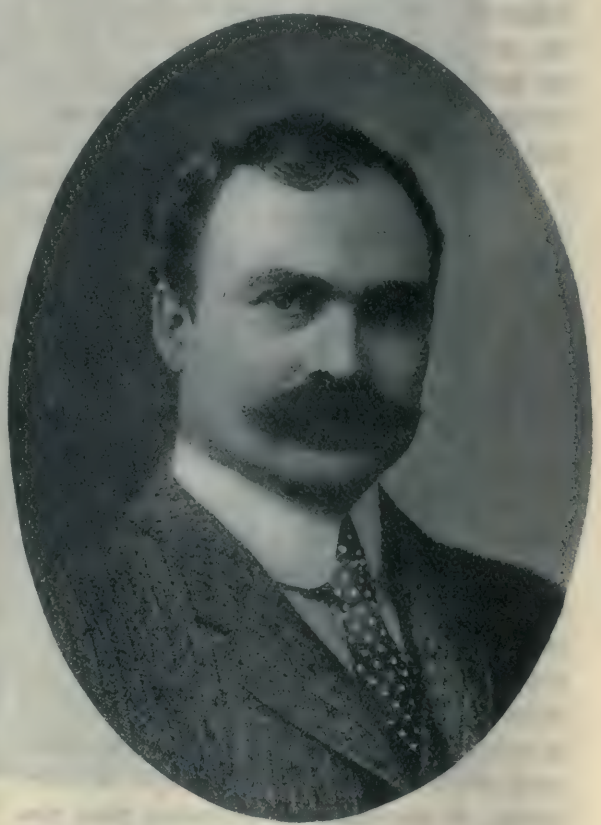
PAGE'S WEEKLY

An Illustrated Technical Weekly, dealing with the Engineering, Electrical, Mining, Iron and Steel, and Shipbuilding Industries.

VOL. VI. LONDON, FRIDAY, JUNE 23, 1905. No. 41.

The Offices of "Page's Weekly," Wednesday Evening.

AMONG the various subjects dealt with at the Liége meeting of the Institution of Mechanical Engineers, the most appropriate was probably that of M. Rodolphe E. Mathot, of Brussels, on the growth of large gas-engines on the Continent. Members had the opportunity of inspecting some of the installations described, with the subject fresh in mind, and the paper will serve to remind inventors that the large gas-engine, though marvellously developed during the past five years, is still capable of improvement. As the author pointed out there is much to be done also in the direction of eliminating impurities in the gas. In spite of all precautions, tar still remains the principal element destructive to the engine. It adheres to the sides of the passages, causes the valves and piston-rings to stick, thus preventing their proper action. It also deposits itself in the cylinder where it finally gives rise to premature ignitions. Certain coke-oven gases contain as much as 1 gramme of tar per cubic metre. It is this very question of tar which compels us, in order to avoid great complications, to employ exclusively non-caking anthracite coal for suction gas-producers now so largely in use owing to their simplicity and economical efficiency. M. Mathot, it should be noted, mentions no difficulties which can be regarded as insuperable. In fact, he is sanguine that gas-engines will presently constitute one of the most remarkable industrial victories of the age in which we live. Readers will doubtless remember that the question of large gas-engines was dealt with prominently in a series of articles



MR. WILLIAM KERR GEORGE,

President of the Canadian Manufacturers' Association, the members of which are now making a tour of Great Britain.

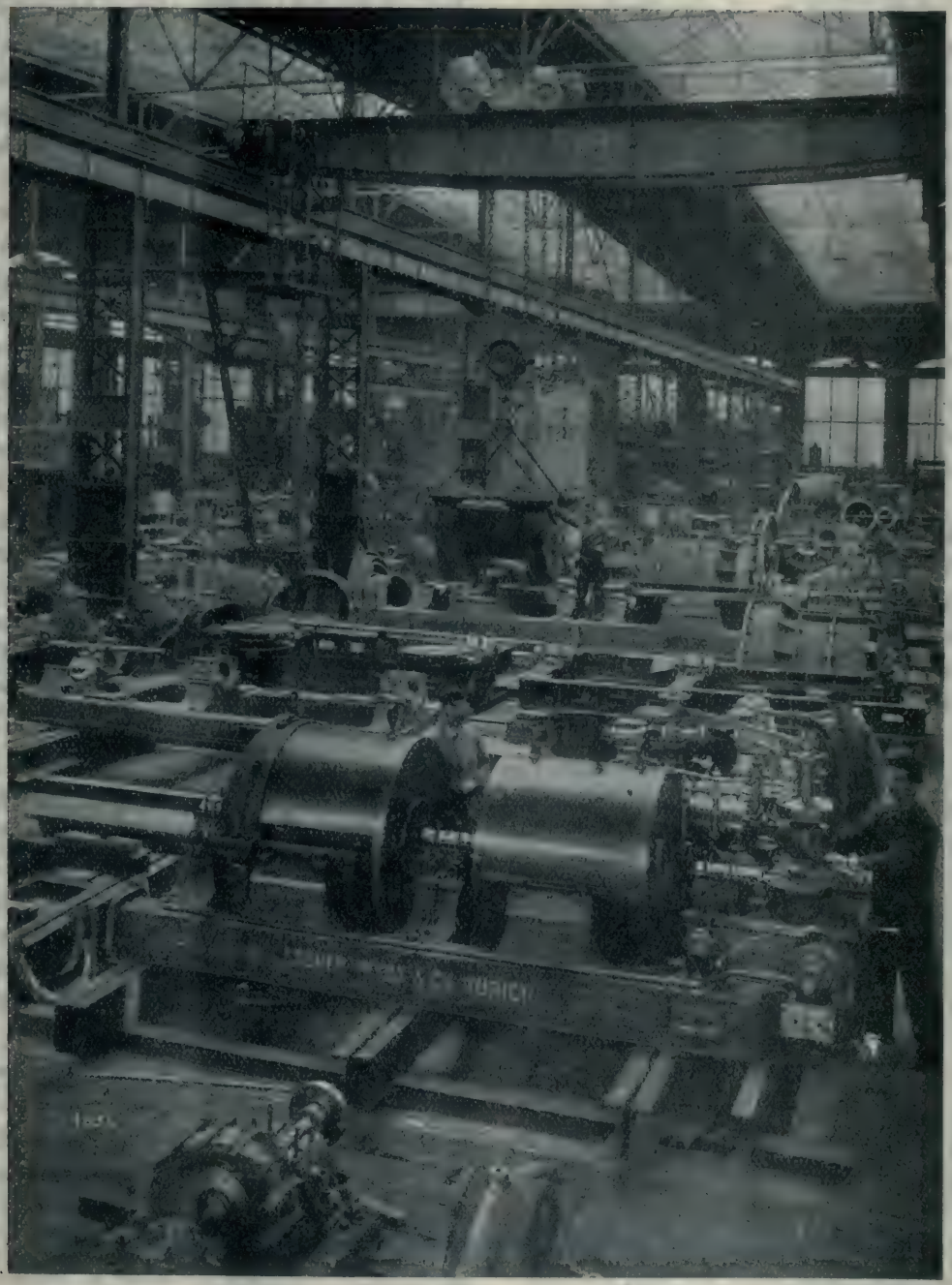
in PAGE'S WEEKLY last year. Another paper of exceptional local interest was Professor Paul Habet's contribution on "Electric Winding Machines," and that the programme generally has so strongly enhanced the interest of the Liége visit, reflects considerable credit upon the organisers.

Mr. William Kerr George, the President of the Canadian Manufacturers' Association, whose portrait appears on the previous page is the official head of an organisation of considerable importance in Canada, and some 300 members of it are now making an industrial tour of these islands. They were received by the King on Monday last, and they have scarcely a free day during the period of their official visit. They began with the London Docks on Tuesday, and the provincial tour of the party includes all our great industrial show places. Yet, as Mr. George took occasion to point out to a representative of this journal, the educational side is not the most important on the present occasion. The visit of these Canadian kinsmen stands for something more than that.

The Association itself is an important one, having been in existence nearly forty years, although it is only comparatively recently that it assumed a national character. It has now branch offices in many parts of the dominion, and is representative of all that is best and most progressive in Canada's industrial life. The Association works through a number of standing Committees. There is, for instance, the Commercial Intelligence Committee, which gathers news from all parts of the world for the benefit of its members, and this committee has proved of material assistance in extending the export trade of the Dominion. Many people, says Mr. George, do not realise the important place now occupied by manufacturing industries in Canada. They think of it as an entirely agricultural community, and yet it is a fact that the value of the output from Canadian factories in 1901, the year of the census, not taking into account any factory employing less than five hands, was within £6,000,000 of the total combined value of the output of the agricultural, dairy, mining, fishing, and all other industries.

Another committee of the Association is the Transportation Committee, which is under the management of an expert railway man, and which takes up any question of freight rates on behalf of the members of the Association, and if considered necessary, brings it before the Railway Commission. This Committee has, says Mr. George, been of very great service to the members, and the Association can claim that it has won practically every case which it has decided to take before the Commission. The Tariff Committee deals with all matters coming under that head as they concern the interests of manufacturers, while the Parliamentary Committee keeps a close watch upon all legislation affecting manufacturers, and while endeavouring to safeguard the interests of its members, has endeavoured to steer a reasonable course, with the result that it has brought about the defeat or secured the withdrawal of every bill to which it has offered its opposition. Even in such a matter as fire insurance, a department has been created and put in charge of a capable fire insurance man, who will report upon risks and offer advice calculated to secure to members satisfactory and equitable rates from the insurance companies.

Although this is the first time the Association has visited Great Britain, in its corporate capacity, its members have made extensive tours of the Dominion itself, and Mr. George thinks it has done something to build up a national feeling as to the importance of Canada as a portion of the Empire. Mr. George states that the reason for this special trip to Europe is as much as anything else to bring Canada



RECENT TURBINES (NO. XI.)—VIEW IN THE SHOPS OF MESSRS. ESCHER WYSS AND CO., SHOWING ZOELLY TURBINE IN FOREGROUND. (*See page* 1333.)

into closer touch with Great Britain, and to bring home the advantages as well as the responsibilities of Empire. The tours of inspection, the visits to Birmingham and Leeds, to Sheffield and to Newcastle, and the bringing of the representatives of Canadian manufacture into close touch with those concerned in our own great industries are all held by Mr. George to be means to one end, the extension and the strengthening of the imperial instinct.

———

In view of the importance of a cheap and simple source of power to agriculturists, the Highland and Agricultural Society of Scotland have decided to carry out a series of comparative trials of suction gas producers and gas engines at their forthcoming Glasgow show. No award is to be made, but a full report will be prepared, giving the results of the trials, which will commence on the 29th inst. Two classes of plant are specified, viz., capacity 5 to 8 b.h.p., and 15 to 20 b.h.p. at full working load. Each plant will be subjected to three complete tests to determine the fuel consumption at: (1) full load, (2) half load, (3) light load. In addition, there will be a further test to ascertain the length of time required to get a plant up to full working load, starting with producer empty and cold. In each of the first three tests the time of starting a test will be taken when the producer is filled with fuel to a definite level, which will be noted, the ashes and clinker having been previously cleaned out, and the engine working steadily at the stated load. At the end of the test the producer will be brought to the same condition as to fuel, etc., as at the start, and the fuel consumption determined from the amount introduced into the producer during this period. The ashes and clinker formed during each test will be weighed and samples taken. The producer will be examined from time to time during the tests to see that it is being properly worked. The duration of each of the first three tests will not be less than eight hours, and may be extended.

Last week we discussed the necessity for special motor-car ways. While present conditions exist, the manufacturers of motor-cars can do something to abate the nuisance, for it has been shown that the structure of the car materially affects its dust-raising qualities. In the recent dust-rasing investigation by the Automobile Club, it was demonstrated that hard tyres are better than soft to prevent dust raising, and narrow tyres are better than broad, because there is less of the tyre on the ground. Big mud-guards may have a bad influence, especially if they come low down. Cars which are low underneath are worse than cars a long way off the ground, for low cars sharpen the draught, whereas high cars lessen it. Smoothness of bottom shape and absence of forward coning are infinitely more important, for they tend to prevent eddies and strongly agitated movements of the air. There is evidence that cars should slope upwards towards the back, because the air is then free to get away slowly, without any disturbance, and no effect is produced on the dust.

———

Notwithstanding the decision of the Panama Committee to throw open the supply of machinery to the entire world, considerable doubt is entertained as to whether the invitation is seriously meant. Not only are tenders apparently only being advertised in America, but the time for sending in prices is so short as practically to exclude European manufacturers. At the same time, the Board of Trade has arranged for telegraphic transmission of all contracts likely to be of service to British manufacturers. There appears to be a strong feeling in America that the Canal should be in all respects a home production, and the Commission has been strenuously criticised because it proposes to purchase over here the two steamships which it needs to ply between America and Panama. There really is no occasion for this attitude. Our purchase of the Atbara Bridge from America offers an exact parallel.

PAGE'S WEEKLY

An Illustrated Technical Weekly, dealing with the Engineering, Electrical, Mining, Iron and Steel, and Shipbuilding Industries.

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New Copy for Advertisements,

Alterations, &c., intended for insertion in the current week's issue must be delivered **not later than 4 p.m. on Monday.** If proofs are required the copy and blocks should reach us several days earlier.

MEETINGS, ETC., FOR THE ENSUING WEEK.

FRIDAY, JUNE 23.—Municipal County Engineers: Annual Meeting.—Institution of Mechanical Engineers, Last Day, Summer Meeting at Liége.

MONDAY, JUNE 26.—International Congress, Mining and Metallurgy, opens at Liége.—Junior Institution of Engineers: Opening of Coming of Age Meeting in London.

TUESDAY, JUNE 27.—Incorporated Municipal Electrical Engineers: Annual Convention opens at Edinburgh.

WEDNESDAY JUNE 28.—Society of Arts: Annual General Meeting.

THURSDAY, JUNE 29.—Society of Arts, Conversazione.—British Association of Waterworks Engineers: Annual Meeting opens at Hastings.

NEWS ITEMS.

A Panama dispatch states that the yellow fever is decimating the ranks of the white men employed in the canal operations.

Sir John Wolfe Barry has been appointed Chairman of the Engineering Standards Committee in succession to to the late Mr. James Mansergh.

Considerable progress is being made with the steel-rail mill of the Dominion Iron and Steel Company, at Sydney, N.S. The full capacity of the mill will be 1,000 tons per day.

It is stated that the directorate of Nobel's Dynamite Trust have arranged with the Government of the Mikado for the erection of a factory in Japan for the manufacture of blasting explosives and war material.

Orders have been issued at the North-Eastern Railway Company's works at Gateshead for the construction of twenty new class locomotives of average weight and haulage capacity. A number of steam autocars, similar to those now in service between the Hartlepools and on the newly opened Ponteland line, will shortly be commenced.

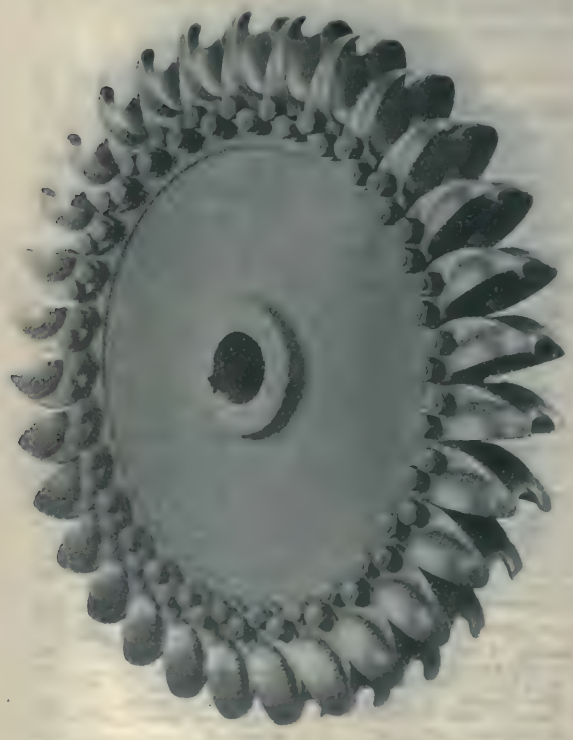
The following obsolete vessels are ordered to be offered for sale at Portsmouth Dockyard on July 11th: Cruisers *Hector*, *Orlando*, *Magiccienne*, *Blanche*, *Iris*, *Blonde*, *Fearless*, and *Barossa*; torpedo gunboats *Jaseur*, *Boomerang*, *Karrakatta*, and *Grasshopper*, the sloop *Beagle*, gunboats *Fancy* and *Pincher*, the late Admiralty yacht *Enchantress*, the hulks *Pitt*, *Lion Myrtle*, and *Hamadryad*, sailing brigs *Nautilus* and *Liberty*, and the tank vessel *Pelter*.

CONTENTS.

Mining Institute of Scotland.

The coal-producing possibilities of Fifeshire were very strikingly emphasised on Saturday to the 160 members of the Mining Institute of Scotland who made the district the venue of their annual excursion. The Mary pit at Lochore, which is at present being sunk and fitted up, aroused considerable interest, and it is claimed that two years hence, when it is expected to be in full operation, it will be one of the finest pits in Britain. The area which the pit is intended to work is calculated to contain upwards of 30,000,000 tons of coal. A mile or so distant from Lochore is the Aitken pit, Kelty, which is 1,260 feet deep, and has a daily output of 2,000 tons. The output here for 1904 was almost 500,000 tons, and it is the sanguine expectation of the promoters that the Mary pit will even establish a finer record.

The Metropolitan District Railway has opened a new piece of electric railway between South Acton and Hounslow. It is expected that the running of the electrically propelled trains on the Inner Circle will be commenced early in July.



REVOLVING ELEMENT OR RUNNER OF THE DOBLE TANGENTIAL WATERWHEEL. (*See page* 1350.)

Marconigrams.

Mr. Marconi is said to be confident that when his new plant is in operation at Glace Bay, messages will be sent at a speed of over one hundred words a minute. Over $220,000 has already been expended on the station, in connection with which eight spars, each 180 ft. high, have been placed in position, to be supplemented by sixteen more at an early date. Several other stations on the coast will also be placed in operation, and with successful culmination of this project steps will be taken to communicate with Gibraltar and Mediterranean. The projected stations at Halifax and Sable Islands will be installed this summer, and it it expected that overland communications will be made to Winnipeg and Vancouver before the end of the presen year.

Indian Irrigation.

The Government of India recently published the report of the chief engineer, Mr. J. Benton, C.I.E., on the Project Estimates of the Upper Jhelum, Upper Chenab, and Lower Bari Doab canals, the construction of which has been recently authorised. The entire scheme is one of considerable importance and magnitude, involving an expenditure of, approximately £5,216,000. The following are the leading particulars concerning the three canals :—

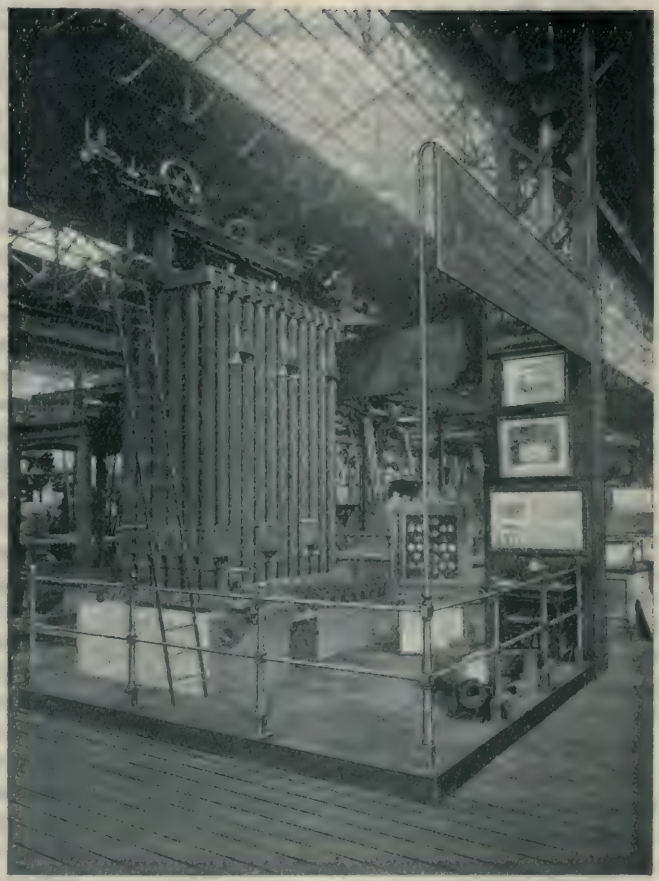
Particulars.	Canal.		
	Upper Jhelum.	Upper Chenab.	Lower Bari Doab.
Length of Main Line (miles)	88	99	43
Length of Branches (miles)	48	113	113
Length of Distributaries (miles)	562	1,092	1,060
Discharge at Head of Main Line (cusecs)	8,500	11,694	6,481
Annual Irrigation (acres)	344,960	648,367	882,528
Annual Gross Revenue, Direct and Indirect (rupees)	18,35,040	32,14,789	45,32,640
Annual Nett Revenne, Direct and Indirect (rupees)	13,60,720	25,66,422	38,70,744

The annual amount of land to be irrigated by these canals is estimated to be 1,875,855 acres, while it is highly probable that this will exceed 2,000,000 acres as the works become fully developed. On their completion famines ought to cease in the Gujrat district, which will be irrigated by the Upper Jhelum Canal;

the dense population of the Upper Rechna Doab, to be irrigated by the Upper Chenab canal, will find their circumstances greatly improved; while the Sharakpur Tahail of the Lahore district will become as prosperous as the Chanab Canal Colonies, and the great unfructuous dry jungle wastes of the Lower Bari Doab, to be irrigated by the Lower Bari Doab Canal, will become one of the richest and most fruitful in the province. In addition, the widespread failure of crops dependent on rainfall in Gujrat, Shahpur, Gujranwala, Lahore, Montgomery, and Moultan districts, may be expected to practically cease for those portions of these districts which lie within the tracts commanded by the proposed works.

Green's Economiser at Liege Exhibition.

The British Section in the Machinery Hall at Liége Exhibition is situated at the extreme end of the Machinery Hall, and is but a poor representation of the engineering firms of this country, there being only seven exhibitors in all. It is bounded on one side by the German Section, by the American Exhibition another, and on the third side by the Belgian Section. Messrs. E. Green and Son's, Ltd., stand, illustrated herewith, occupies a corner position in the British Section, and they certainly have made the most of the small space allotted to them. At this stand the well-known Green's Economiser is shown, the apparatus exhibited containing seventy-two heating tubes, equalling 720 square feet of heating surface. The scraper gearing is in motion, being driven by a 1 h.p. electric motor attached to the gearing frame on the top of the apparatus. The economiser is erected on a brickwork foundation, faced with white tiles, which materially adds to the appearance of the exhibit. The economiser is of the high-pressure type, constructed to work from 160 to 200 lb. pressure on the square inch. Attached to the gearing frame also is a small horizontal steam engine which shows the alternative method of driving the gearing where electric current or other methods are not available. At the stand also Messrs. Green show a very ornate medal case, wherein are displayed the numerous medals that have been awarded for their apparatus.



GREEN'S ECONOMISER AT LIEGE EXHIBITION.

The Zoelly Turbine.

The illustration on page 1329 shows the Zoelly turbine under construction by Messrs. Escher, Wyss and Co., Zurich. Dr. A. Stodola, in his new work on steam turbines, gives a very complete account of a series of experiments made with a steam turbine set up in the shops of the Escher, Wyss and Cie Machine Works, Zoelly system, for a normal load of 500 h.p., with 10 atmospheres boiler pressure (161·7 pounds per square inch absolute) and 3,000 revolutions per minute.

The turbine is described as a many stage impulse turbine, lying to a certain extent at the boundary between the "nozzle" and the "blade" types. In this turbine there are only so many stages chosen that the guide arrangements may be constructed from ordinary blades without using the nozzle form, whose divergence is looked upon as harmful. [A distinguishing feature is the radial divergence of the rotating blades, which makes possible the use of smaller exit angles.

The Junior Institution of Engineers.

The summer meeting of the Junior Institution of Engineers is this year to be of a special character in celebration of the Society's coming of age. It is to be held earlier than usual so as to include Foundation Day (the June 30th), and will open on Monday morning, June 26th, when the Lord Mayor and the Sheriffs will receive the members in the Council Chamber of the Guildhall of the Corporation of the City of London. The proceedings will include the reception of representatives of kindred associations, the presentation of a historical note by Mr. W. J. Tennant, Past-Chairman; a short address by the President, Mr. W. H. Lindley, of Frankfort-on-Maine; and votes of thanks after which an adjournment will be made for luncheon.

In the afternoon there will be a special visit of inspection of St. Paul's Cathedral, under the guidance of the Archdeacon of London and the Consulting Architect, Mr. Somers Clarke, followed by a choral service with appropriate anthem, by permission of the Dean and Chapter, Sir George C. Martin, Mus. Doc., the organist of the Cathedral, at the organ. The members are afterwards to be received by the Lord Mayor and Lady Mayoress at the Mansion House.

On Tuesday both the morning and afternoon will be devoted to visiting Woolwich Arsenal, under arrangements specially made by Mr. H. F. Donaldson, Chief Superintendent of Ordnance Factories. In the evening a reception will be given by the Institution at the Royal United Service Institution, Whitehall. The museum will be open, a regimental band will perform, vocal selections will be rendered, and short illustrated lectures by Professor Lambert and Mr. J. P. Maginnis are announced in the programme.

For Wednesday, visits have been arranged to the Royal Mint, Messrs. Yarrow's works, Poplar, the North London Railway works, Bow, and the Greenwich Generating Station of the London County Council tramways (where the engines are in course of erection), and to the New Cross depot.

On the following day an excursion to Chatham will take place, for which the *Clacton Belle* has been chartered, to leave London Bridge at 10 o'clock. On arrival at Chatham the dockyard will be visited, and the return to London will be *via* the Nore.

Friday morning will be occupied with visits to Messrs. Doulton's Potteries, and to the Neasden Power House of the Metropolitan Railway. In the afternoon and evening the members and their friends will foregather at Earl's Court for an inspection of the Naval, Shipping and Fisheries Exhibition, concluding with the inevitable dinner. Although the programme specifies no "speeches" on this occasion, there is no doubt that congratulations will be exchanged on the Institution having completed that day twenty-one years of most useful service in the interests of the junior members of the engineering and allied professions.

Head, Wrightson and Co., Ltd.

A satisfactory financial position is disclosed by the accounts of Head, Wrightson and Co., Ltd., for the financial year ending April 30th last, and the directors are to be commended on the short time which has been allowed to elapse between the closing of the books and the presentation of the report. Their practice in this respect offers a pleasing contrast to the leisurely methods of many industrial companies, who only issue their reports at a date far removed from the period to which the accounts refer. The story told in the accounts is, as indicated above, a record of prosperity. The gross profits for the year amount to £52,102, and adding the sum brought in, £4,229, the available balance reaches a total of £56,331. From this falls to be deducted preference dividend £6,300, which leaves a balance roughly of £50,000. With this sum in hand it would have been easy to have paid a large dividend on the ordinary shares, but the directors have contented themselves with the modest distribution of 7 per cent., and as this requires only £14,750, it is clear that the financial policy pursued is a thoroughly sound one. A sum of £10,000 is written off for depreciation in respect of capital expenditure, a like amount is allocated to general reserve, and the sum of £6,608 remains to be carried forward. The total reserves of the company now amount to £93,000, or nearly one-third of the whole of the issued share capital, and the Board are to be congratulated on a position which so amply safeguards the future of the enterprise. A word of criticism suggests itself, and that is that so small a proportion of the reserve funds are separately invested, but this is an old and vexed question, and the answers to it are obvious enough.

Mr. A. E. Carey, M. Inst. C.E., of 3, Victoria Street, S.W., has acquired the practice of the late Mr. Wm. Jaffrey. The practice was originated by the late Mr. W. R. Kinipple in 1858. The overlapping of two letters in the MS. last week resulted in Mr. Carey's name being given as Grey.

The paper on the "Improvement of London Traffic," by Messrs. Charles Scott Meik and Walter Beer, an abstract of which appeared in our issue of the 9th inst, was read before the Society of Engineers, and forms a part of the transactions of that institution.

INSTITUTION OF MECHANICAL ENGINEERS.

SUMMER MEETING AT LIEGE.

THE train slows down, and as it comes to rest at the platform we realise that this is Liége, the Sheffield of Belgium, as it has been aptly termed. The capital of the Walloon district occupies a strikingly picturesque situation on the high banks of the broad Meuse, but the industrial activity of the place adds a charm to it from the mechanical engineering point of view superior to that of mere natural beauty. Indefatigable industry is a striking characteristic of the Walloon race, and here one expects to see the highest exemplification of this quality. Coal mining is, of course, the basis of the modern industrial prosperity of the town, but for the manufacture of weapons its craftsmen have been long famed. Of Liége, however, more anon. For the moment we are the merest birds of passage, and Spa is to be our headquarters during the Belgian meeting of the Institution. The railway from Liége to Spa is not only remarkable for picturesque views, but the line itself is a tribute to British engineering skill, and the Vesdre is bridged again and again in the short journey of twenty miles. After passing the junction of Pepinster the railway passes the little town of Theux, where are situated several cloth factories and some ironworks, and reaches Spa on a gradually rising gradient.

The invasion of Spa began on Saturday last, and Monday found a large contingent of members housed in the charming little hill resort. The place has lost some of its old attractions. The well-known gambling house of Vauxhall is now an orphanage, and even the recreations of the Kursaal are fenced round with some restrictions. Save that of keeping hotels and lodging-houses, the town boasts no industry. An excellent train service has made Spa almost a suburb of its industrial neighbour, and here many members intend to take our ease during the short intervals of a week of functions. In truth there is very little to do at Spa itself. One can drink the waters, lounge in the Promenade de Sept-heures, and verify for oneself the merits of that fine liqueur, the elixir of Spa.

At these annual excursions of the Institution there are usually many meetings of old friends, and those who attended at the secretary's office at the Liége University on Monday morning for the purposes of registration witnessed many such reunions. The University dates back to the beginning of the last century. It was founded in 1817 as a State Institution, and reorganised in 1834. It is built in the Renaissance style, with plain sandstone façade.

The evening of Monday saw the formal opening of the programme of business and pleasure which had called the members together. In the handsome Town Hall of Liége, the members of the Institution were entertained at a reception, and the welcome accorded to the visitors was a very warm one. A late special train ran to Spa after the reception.

Tuesday morning ushered in a very busy day, members assembling at the early hour of 10 a.m. for the reading and discussion of the papers which will be found reported in this issue. The sitting was adjourned shortly after mid-day for the serious business of luncheon at the Restaurant Lisansky, in the Exhibition grounds.

In the afternoon members had an embarrassment of entertainments from which to choose. They might go to the Exhibition, which, of course, was a standing dish during the week, or they could journey by steamboat to the Cockerill works. If they elected to do the latter, then when the Cockerill establishment had been done, there were still six separate and distinct things from which to choose as an occupation for the rest of the afternoon. It was a difficult thing to discriminate between the varied attractions of the machinery at the Ateliers de la Meuse, the steam turbines of the Station Centrale, the cut gears at the Ateliers de Malzine, the steel plant at Aciéries d'Angleur, the Fonderie Ketin, and the engines at the Maison Beer. And then, again, instead of going to the Cockerill works you could pay a visit to the Société d'Ougrée-Marihaye. The day ended with the evening banquet in the magnificent Renommée Hall, a fine specimen of ferro-concrete construction, where members dined by invitation of the Liége Association of Engineers. It is needless to add that the Spa contingent did not arrive at their hotels until the small hours.

On Wednesday morning the programme was again reading and discussing papers. In addition to the usual luncheon at the Exhibition, there was a special luncheon at the Hôtel d'Angleterre, and thereafter another programme of visits to be compassed within the space of a few short hours. First to the Fabrique Nationale d'Armes de Guerre. This was the chief tour of the afternoon, but it was possible in addition to study copper at the Chaudronneries Peidboeuf,

machines at the Ateliers de St. Leonard, or to inspect the works of the Compagnie Internationale d'Electricité.

In the evening the entertainment, in which the ladies of the party participated, was an evening fête at the Exhibition, embroidered with all the usual accessories indispensable to such occasions, and again it was a case of reaching the Spa headquarters at something after midnight. It had become clear by this time that the Institution was making a real business of the pursuit of pleasure.

The whole of Thursday was devoted to visiting places of industrial interest, and many ladies accompanied visitors on these excursions. The inspection of Barrage de la Gileppe was a whole day affair, and it included a pleasant drive from Spa. The alternative programme included visits to the Charbonnage du Hasard, where electric winding machines were in operation, as was also the case at the Charbonnage de l'Espérance, and a sight of Jules Melotte's works, where separators were on view. Other parties visited the mechanical and electrical laboratories of the University. In the evening the Institution dinner was held at the Hôtel Britannique at Spa, which was practically the final function in connection with the visit to Liége.

To-day, Friday, members were to leave Liége by special train for Antwerp, where a four hours' visit was to be paid to the docks and quays.

After that the home-coming. H. S.

LARGE GAS-ENGINES ON THE CONTINENT.

M. Rodolphe E. Mathot read a paper on this subject of which the following is an abstract —

The development of large gas-engines can be said not to date back further than five to six years. Eight to ten years ago they were initiated simultaneously in Germany, England and Belgium, early attempts being made to utilise blast-furnace gas, which was expected to open up such a vast field for the employment of large engines. Although the first trials were only attempted on small engines, the results of the experiments soon gave encouragement to the efforts of the investigators. The Cockerill Company, of Belgium, constructed a single-acting Otto cycle engine, of 200 h.p., which has been working regularly at their establishment for six years. This stage in the path of progress was strongly accentuated by the 600 h.p. engine on the Delamarre-Debouteville system, which the Cockerill Company exhibited at the Universal Exhibition at Paris, in 1900. This magnificent engine was single-acting, the piston having a diameter of 1·300 metres (4 ft. $3\frac{3}{16}$ in.), and a stroke of 1·400 metres (4 ft. $7\frac{1}{8}$ in.).

Although the generic theory of gas-engines has rested up to the present on a series of hypotheses which have not yet received experimental confirmation, these engines have gained ground in application to various industries with exceptional rapidity, compared with any other kind of motive power. The invention of gas producers and the improvements made in the last few years, and especially in those working with the direct suction of the engines, are manifestly most important factors in this success.

The merit of having entered upon the new phase which the contruction of gas-engines has followed for five or six years undoubtedly belongs to the Germans. The old makers of gas-engines in Germany took the initiative of departing from old methods. In a short time their processes were themselves improved and perfected by the makers of steam-engines long accustomed to circumvent or overcome practical difficulties in the construction of large engines. Without large gas-engines tending towards a single type it may be said that they all have manifest tendencies to resemble the modern steam-engine from the point of view of their form and valve gear. Having regard to the fact that valves are the common means of distribution, that they are operated by a side shaft, and that large engines now work double-acting, it was natural and logical that the explosion machine should borrow from the steam-engine the design and methods with which it has been equipped in its long career. The introduction and growth of suction gas-producers and the utilisation of blast-furnace gas, coke-oven gas, etc., which have marked the development of large gas-engines, have led to the creation of different designs for their construction. Different principles have thus been modified in their applications, such as the regulation, the compression, the cooling, the ignition.

The author examines in their main features the improvements in the construction of large engines during the last three or four years.

OECHELHÄUSER ENGINE.

This system was one of the first to be applied to high-power engines. It was put into practice in the early part of 1898 in the shape of a 600-h.p. engine, and on that occasion disclosed its excellent qualities, which have continued throughout a period of seven years' work. The main feature of the system consists in the employment of two trunk pistons working in a single cylinder. In this engine the distribution is

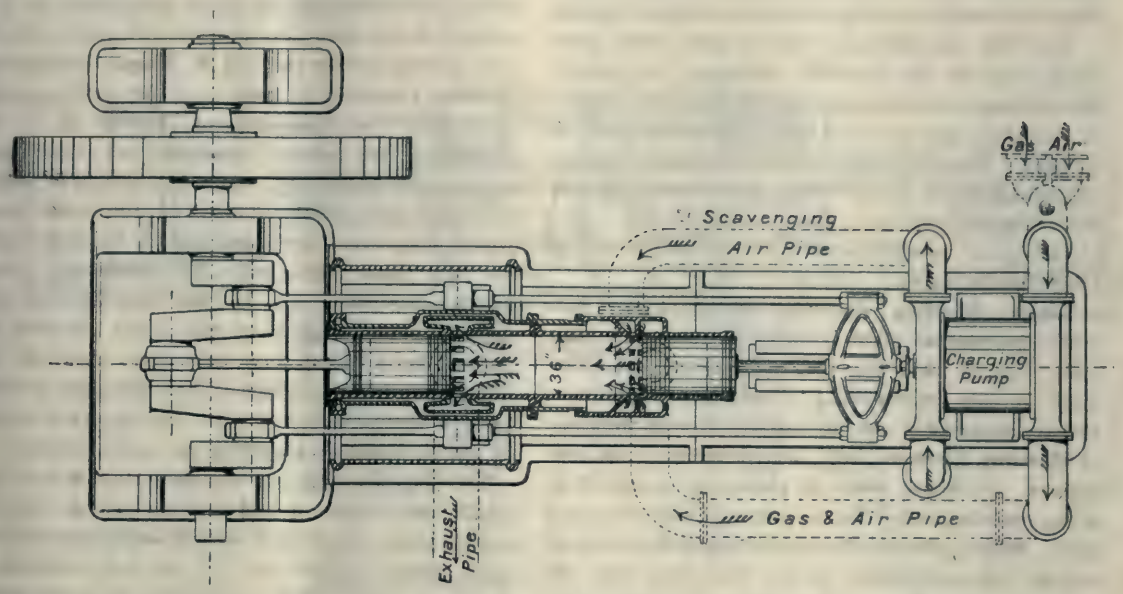


FIG. 1. BALANCED-ACTION 1,000-B.H.P. OECHELHAUSER TWO-CYCLE FURNACE GAS-ENGINE.

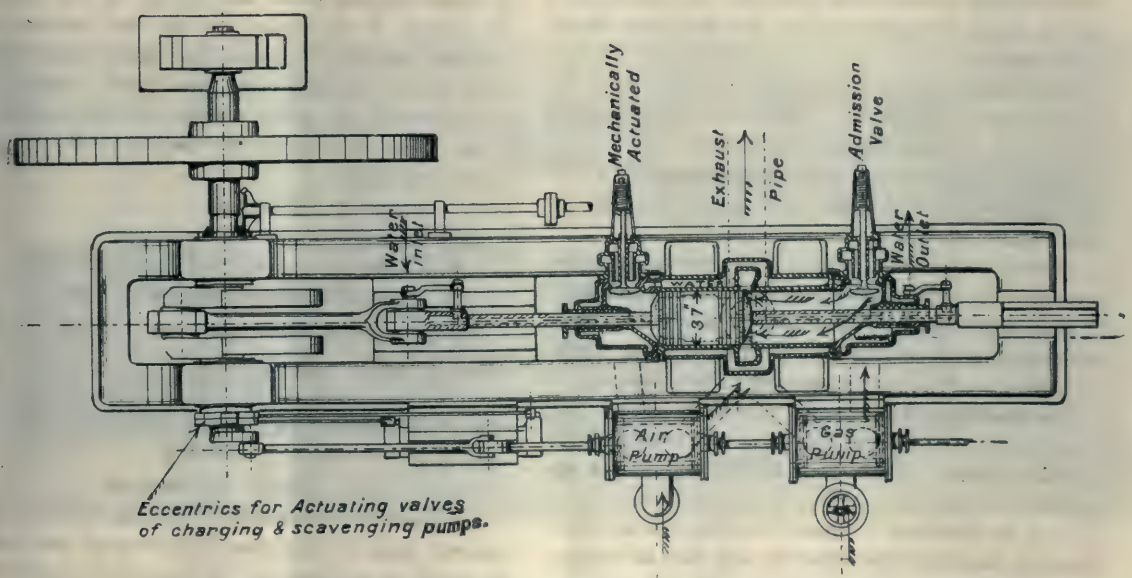


FIG. 2. DOUBLE-ACTING KOERTING 1,000-B.H.P. TWO-CYCLE FURNACE GAS-ENGINE.

effected without the intervention of valves, a feature which is the more interesting because in large engines the valves constitute delicate organs of difficult upkeep.

The Von Oechelhäuser engines have been made since 1899 by the Deutsche Kraftgas Gesellschaft Several important firms are making them under licence, or for their own account after having acquired the patents. Thus some sixty of these engines, representing a total power of 50,300 h.p., have found their way into different countries, and particularly for use in metallurgical establishments. Fig. 1 illustrates an Oechelhäuser engine.

Messrs. Koerting Brothers, of Hanover, have made gas-engines since 1881, and producers since 1889. Up to 1896 this firm had turned out about 3,500 engines, representing 15,000 h.p. Since that time the Koerting Works, now carried on under the name of Koerting Brothers, Ltd., has produced 7,200 new engines. In recent years in particular, 50,000 h.p. in two-cycle engines of their special type have been supplied. Side by side with the construction of the two-cycle engines the construction of the four-cycle type has developed, and the sale has attained 100,000 h.p., whilst at the present time engines are under construction representing several thousands of horse-power. The double-acting two-cycle engine is represented in fig. 2.

FEATURES OF THE KOERTING TYPE.

The ignition of the mixture and the development of the motive pressure take place after the itroductio n of the charge and quite close to the back dead centre of the piston.

The expansion of the ignited mixture and the transmission of the power to the crank-shaft take place during the forward motion of the piston.

When the piston has reached its front dead centre the expulsion of the products of combustion and the admission of the new mixture take place.

During the backward stroke of the piston the latter produces the compression of the explosive mixture.

This work, which is accomplished in the Otto cycle single-acting engines during four strokes of the piston, is effected in the Koerting engines in two strokes.

The regulation is obtained in two ways, by retarding the delivery of the gas pump, and by establishing a passage between the delivery and suction of the gas pump.

It is the Koerting Company which has, so far, fixed the most important installations, and they necessarily consist of double-acting engines. Mention may be made of the power station of 5,500 h.p. of the Gutehoffnungshütte establishments at Oberhausen (Rheinland), equipped with seven engines, four of which are 1,000 h.p., and three of 500 h.p.

The Koerting engines were the first explosion engines used in America for the utilisation of blast-furnace gas, which innovation was the more remarkable as it involved, at the outset a total power of 42,000 h.p. It was carried out by the De la Vergne Refrigerating Machine Company, of New York, for the Lakawanna Iron and Steel Company, of Buffalo (N.Y.), and consists of ten coupled dynamos and two-cylinder engines of 1,000 h.p. each, for electrical service, (fig. 28); and sixteen engines of the same power which drive from their crank-shaft blowing engines for the blast furnaces, This particular installation constitutes up to the present the most important power-house in the world. Several important installations have also been made for the utilisation of lignite, which is very abundant in many parts of Europe and America. This lignite is treated by special producers supplying gas under pressure.

The Cockerill Company was one of the first to take up the construction of double-acting engines, and thus created at the end of 1901 its first single cylinder Otto-cycle engine of 1,200 h.p. for the blast furnaces of their own works. The construction of double-acting engines has become common, and they have replaced the single-acting type, which is now only constructed in exceptional cases. Before arriving at their present type the Cockerill Company created quite a series of engines, all of which are remarkable for a manifest tendency to depart from common principles in order to attain original forms and devices of real interest. As makers of machinery for the iron industry the Cockerill Company is, in fact, in a better position than most people to appreciate the many requirements to be satisfied by engines suitable for this industry.

The types constructed by the Cockerill Company are divided into—

(1) Single-cylinder engines.
(2) Engines with two twin cylinders.
(3) Engines with two cylinders tandem.
(4) Engines with four-cylinders twin tandem.

We illustrate a four-cycle two-cylinder tandem Cockerill engine in figs. 3 and 4.

With their engine of the four-cylinder twin tandem type, double acting, the Cockerill Company can obtain a prime mover of 5,000 to 6,000 h.p.

THE DEUTZ GAS-ENGINE.

The record of the Deutz Gas-Engine Works is well known. Since its formation this company has turned out nearly 70,000 engines. It necessarily commenced with the small single-cylinder horizontal and vertical engines, since 1895 it has been engaged in the construction of high-power blast-furnace single-acting engines attaining with one, two, and four cylinders,

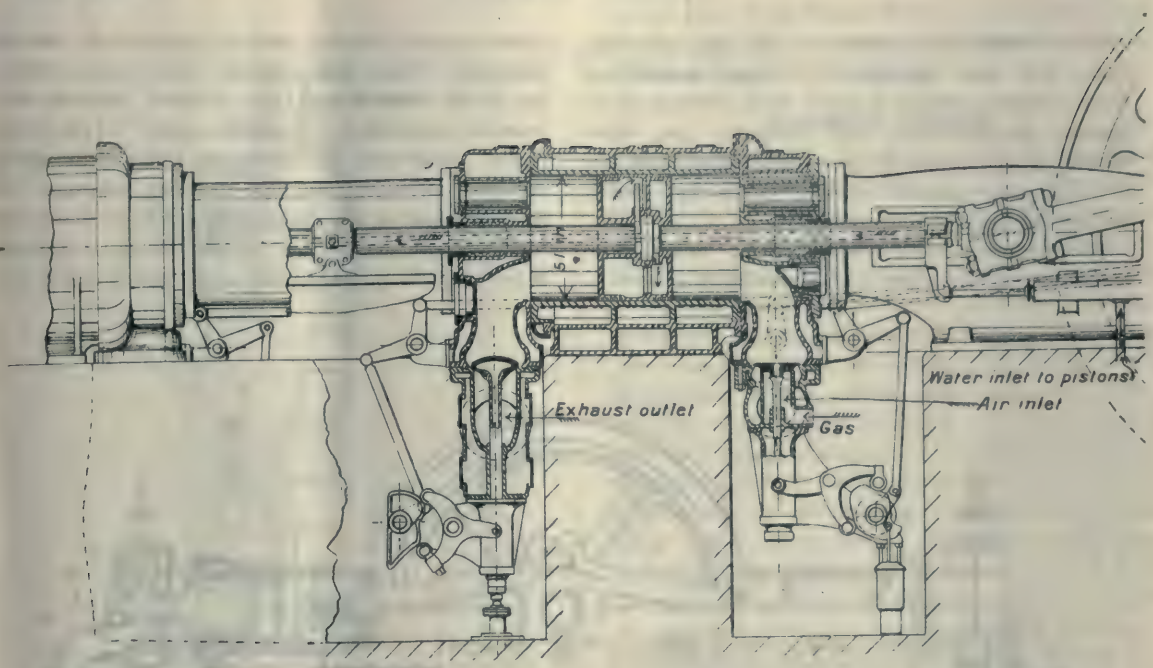


FIG. 3. FOUR-CYCLE ACTION TWO-CYLINDER TANDEM DOUBLE-ACTING FURNACE GAS-ENGINE. 2500-B.H.P., COCKERILL SYSTEM, CYLINDERS 51 IN. DIAMETER, 55 IN. STROKE.

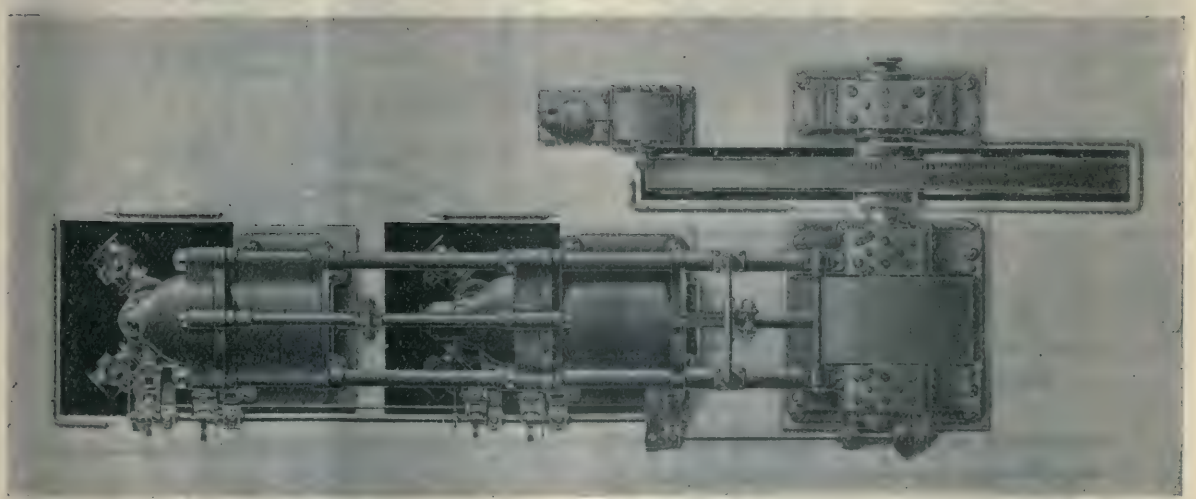


FIG. 4. FOUR-CYCLE ACTION TWO-CYLINDER TANDEM SINGLE-ACTING FURNACE GAS-ENGINE. 1300-B.H.P. COCKERILL SYSTEM.

twin or double-twin, powers of 125 h.p., 500 h.p., 1,000 h.p. and upwards. A large number of these engines were in a short time working in industrial establishments with generator gas, blast-furnace gas or cove-oven gas, whilst others took the place of steam-engines in water-works and electric stations for towns, etc.

The 1,200 h.p. four-cylinder engine, exhibited at Düsseldorf in 1902, won the admiration of experts as being a type of the most powerful engine of the time in Germany. These large engines, constructed according to the single-acting type, attained, however, the excessive weight of 180 kilogrammes (396·8 lb.) per horse-power. Their price was necessarily high and the space occupied excessive. It was therefore necessary to find a solution of this difficulty in order not to impede the development of large engines. Such a solution is found in the double-acting engine which is now the

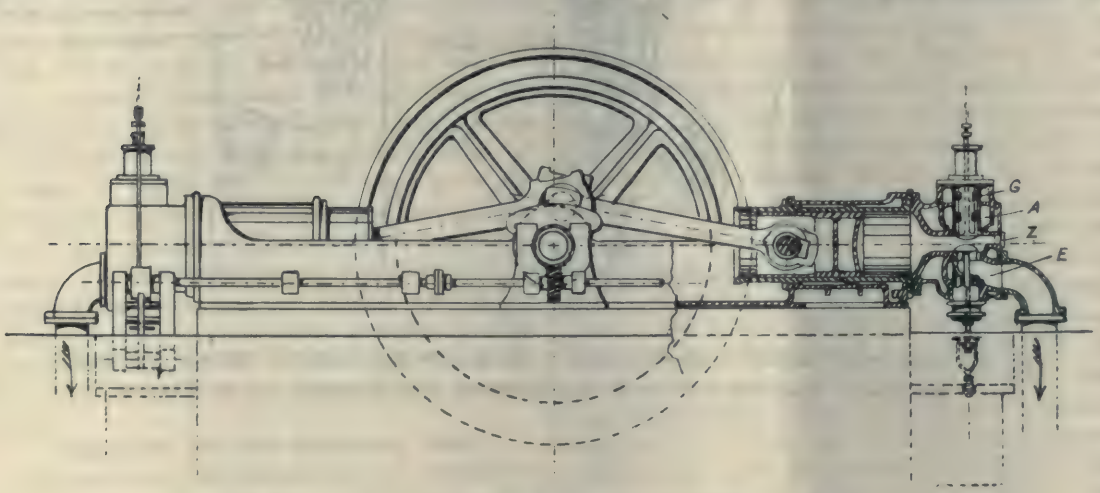


FIG. 5. DOUBLE-CYLINDER 500-B.H.P. DEUTZ-OTTO (VIS-A-VIS TYPE) FURNACE GAS-ENGINE.
G, GAS; A, AIR; F, EXHAUST; Z, ELECTRIC IGNITOR.

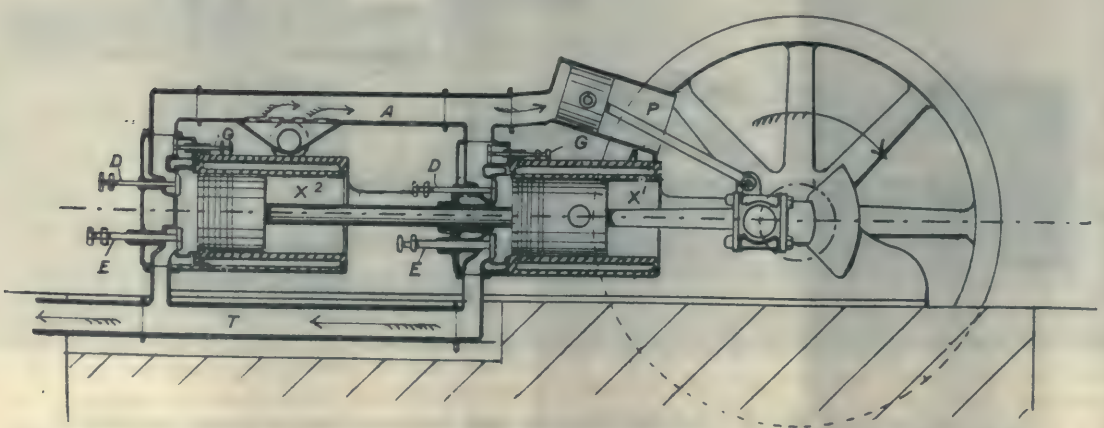


FIG. 6. 500-B.H.P. TANDEM-PREMIER SINGLE-ACTING FOUR-CYCLE FUEL GAS-ENGINE, WITH SCAVENGING PUMP.

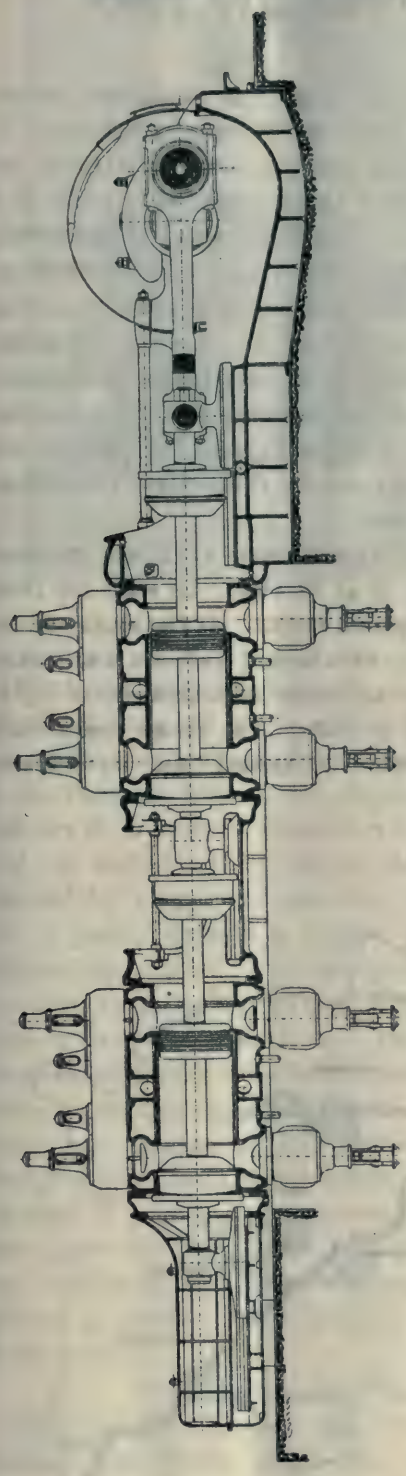


FIG. 7. NURNBERG SYSTEM TWIN FOUR-CYCLE TWO-CYLINDER TANDEM DOUBLE-ACTING FURNACE GAS-ENGINE. 2000 B.H.P., FOUR CYLINDERS, 34-IN. DIAMETER, 44-IN. PISTON STROKE.

current type of the Deutz Works. For powers of 400 to 1,000 h.p., the arrangement of double-twin opposite cylinders was adopted (see fig. 5).

NURNBERG ENGINES.

The "Vereinigte Maschinen-Fabrik Augsburg und Maschinenbau-Gelleschaft Nürnberg" has always devoted itself to the construction of high-power engines and won a well-earned reputation. The experience and practice acquired in this construction, as also the use of powerful and improved tools, placed this company in the best position for constructing large gas-engines. This company quickly discovered that the use of the single-acting engine, whose dimensions were being increased and cylinders multiplied in order to obtain sufficiently powerful engines for modern requirements, was only transitive, the space occupied, the enormous weight and low efficiency of these types of engines being defects which caused them to be abandoned in favour of the double-acting type. Still, for small powers, up to 175 h.p., the Nürnberg Company makes the single-acting engine and even of double this power, if necessary, by using twin-cylinders side by side. In short, although the single-acting engine of the Nürnberg Company has formed the object of several substantial improvements, it is in the construction of double-acting engines that this company especially excels. We illustrate in fig. 7 a Nürnberg twin four-cycle two-cylinder tandem double-acting furnace gas-engine of 2,000 b.h.p.

These engines are made, according to the power required, with one, two or four-cylinders. The single-cylinder engine is made up to 1,500 h.p., the two-cylinder up to 2,800 h.p. and the four-cylinder up to 5,900 h.p., forming in the latter case two tandem engines arranged side by side and driving the same crank shaft.

DINGLER ENGINE.

The Dingler engine, fig. 8, made by the Dingler Engineering Works of Zweibrücken (Alsace) differs materially, from the point of view of the system, from the devices employed by other makers of large engines. Instead of obtaining the double action in a closed cylinder by exploding the mixture alternately on each face of the piston, in the Dingler engine two cylinders open at one end are united at their explosion chambers. As the author illustrated each of these cylinders contain a piston, the two pistons being connected together by an internal rod. The explosion is therefore produced alternately on each inside face of these pistons. The rod common to the piston is provided with rings and works in a casing passing through the division of the cylinder.

(*Continued on page* 1362.)

THE OPENING OF YOKER POWER STATION.

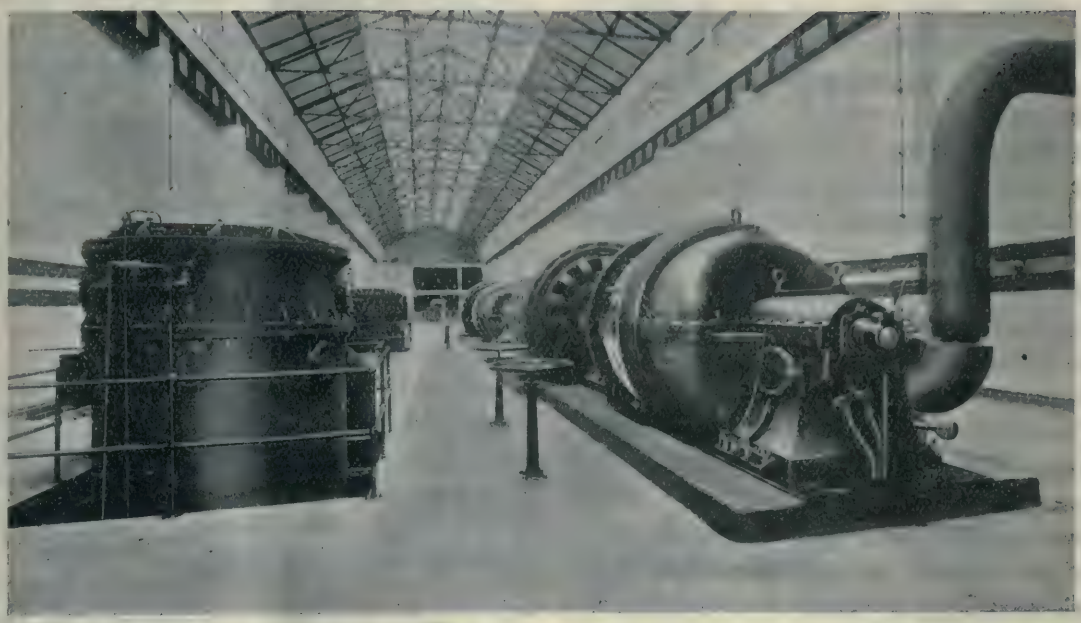
THE Clyde Valley Electrical Power Company, which has for its object the supply of electrical energy for manufacturing purposes, etc., was incorporated by Act of Parliament in 1901, and has obtained powers over an area extending along the Clyde Valley from Craigendoran and Port-Glasgow on the west to Lanark and Shotts on the east. This area comprises about 1,750 square miles, and contains, it is perhaps scarcely necessary to say, the most important manufacturing and coal-producing district in Scotland.

Under their Act of Parliament the company were authorised to acquire land for the erection of generating stations at Yoker and Motherwell, and in September, 1902, a contract was entered into with the British Westinghouse Electric and Manufacturing Company, Ltd., for the erection and equipment of these two stations. The station at Yoker, which was formally opened on Wednesday, is now ready for the generation of energy, the Motherwell station being well advanced towards completion.

In addition to the generating stations, the company have also in hand the laying of a comprehensive system of mains and the erection of a number of transforming stations, which are situated at the most convenient points for serving the largest number of users of electrical energy. A diagram showing the cable routes, as at present located, and the positions of the sub-stations, is reproduced on page 1344. The company will supply energy on the three-phase alternating-current system.

The main engine room at Yoker measures 252 ft. long by 43 ft. wide. Its walls are faced with white glazed bricks. At the south end are situated the switchboard galleries and offices, which have an inside measurement of 53 ft. long by 43 ft. wide. The entire construction of the works is carried out on fireproof principles.

DIAGRAM SHOWING THE CLYDE VALLEY ELECTRICAL POWER COMPANY'S AREA.



MAIN GENERATING PLANT AT YOKER POWER STATION

The boiler room has an inside measurement of 186 ft. long by 50 ft. wide. Over it are placed the coal bunkers, and at the north end is the chimney, built on the Custodis system, and 225 ft. in height. From start to finish the coal is untouched by hand. After being dumped by a hydraulic ram into the crusher pit, it passes through a crusher and screen operated by a motor. It is then picked up by conveyor buckets, and carried to the storage bunkers over the boiler house; from there it passes automatically to the boilers, being weighed —also automatically—in transit. The conveyor was constructed by Messrs. Graham, Morton and Co., and is motor-driven. The same conveyor is also used for carrying the ashes away from the boiler house. To prevent the coal sticking in the shoots a motor-operated agitator is installed, which keeps it constantly on the move.

BOILER HOUSE.

There are at present four double-drum Babcock and Wilcox water-tube boilers in position, fitted with superheaters capable of imparting 136 deg. F. of superheat. The steam pressure at which they work is 165 lb. per square inch. Each boiler is equipped with a Roney mechanical stoker manufactured by the British Westinghouse Company, and these are driven through special worm gearing by two Westinghouse standard engines situated at the side of the boilers. The boilers are connected to a main flue passing along the back, and a Green's economiser of two sections and 480 tubes is installed between this flue and the chimney. The economiser is provided with a by-pass flue, which ensures convenience and safety in operation. Two boiler feed pumps of Messrs. J. P. Hall and Sons' make are situated in the basement. Each is of the tandem-compound double-acting type, and capable of delivering 9,600 gallons per hour against a boiler pressure of 175 lb. per square inch.

The feed water is taken from the hot well, to which it is pumped from the condensers by a centrifugal pump driven by a vertical shaft motor. The make-up water is taken from the

city mains; there is, however, a stand-by suction from the river.

ENGINE ROOM.

The engine-room consists of two floors, all the auxiliaries being in the basement with the exception of the exciting dynamos.

The main generating plant as at present installed, consists of two Westinghouse-Parsons steam turbines, each with a normal capacity of 3,000 h.p. and an overload capacity of 3,750 h.p. These turbines run at a speed of 1,500 revolutions per minute.

The turbines are of the latest double-flow pattern, steam entering at the centre and exhausting at both ends. Each set exhausts directly into its own surface condenser, which is of the vertical type, manufactured by the Mirrlees-Watson Company, of Glasgow, and provided with steam-driven two-stage dry air pumps situated in the basement. Arrangements have also been made for exhausting to atmosphere, if necessary. The circulating water for the condsensers is drawn from the River Clyde, running by gravity into a large circular wall, 18 ft. in diameter and of a depth below low water level of 9 ft.

There are two pipes leading into the well, each of 30 in. diameter, and the water is drawn out through a 36-in. cast iron pipe by means of a steam-driven centrifugal pump situated in the basement. After passing through the condensers the water is discharged by a 36-in. pipe into a spill-way on the bank of the river.

The oiling system for the turbines is arranged as follows: A large tank in the basement of the engine room is filled with a supply of oil which should last from one to two years. This is raised by a special oil pump to a tank in the roof of the boiler house, and from thence flows by gravity under a head of 50 ft. to the bearings. Pressure gauges on the latter indicate that the oil is circulating properly.

Each of the above turbines is directly connected to a Westinghouse 3,000-h.p. generator, which generates electric current at a pressure of 11,000 volts, three-phase, at 25 periods per second. This is the pressure at which current is distributed to the various sub-stations.

The engine room as at present constructed will accommodate one more unit of 2,000 kilowatts, and one of 3,500 kilowatts, which will make the total capacity of the station 9,500 kilowatts, or 13,000 h.p. These additional sets will be added as soon as the load on the station increases, so that there will be always one set spare and ready at any moment in case of accident.

The complete switching apparatus for controlling the whole of the plant in the power house, and also the cables which run to the sub-stations, is situated at the south end of the engine house, and is distributed over four floors.

CABLE ROUTES AND SUB-STATIONS—FIRST INSTALLATION.

The fine lines show cable routes; the heavy dots indicate sub-stations.

On the second or top gallery are placed the main bus bars and the main controlling board, as well as the resistances, etc. The control board consists of a small desk directly facing the various instruments, such as ammeters, voltmeters, power factor meters, indicators, relays, etc. All the main switches and smaller gear are electrically operated from this desk by the exciter current as before mentioned, and the speed of the turbo-generators and their starting and stopping is also controlled from here. The operation of the engine room is thus practically centralised in one spot, which, besides offering a maximum of convenience in working, reduces the chances of breakdown to a minimum.

DISTRIBUTION.

The trunk mains from Yoker station to Clydebank are already laid, as well as nearly all the distributors which will be required in that area. In addition, conduits are laid ready for drawing in further cables to Clydebank on the west, and Scotstoun on the east. The cables to Temple are now being laid, and we are informed that in a very short time the cables will be in, ready for supplying power to any part of the district between Clydebank, Scotstoun, and Temple. These cables are all laid in duplicate.

The company having undertaken to supply motors, visitors to the power station had the opportunity of inspecting a number of these, ranging from 1 h.p. to 50 h.p. It is hoped to furnish manufacturers and others with a supply of power at a lower cost than they have been able to produce it for themselves, the company having arranged their rates in such a manner as to make them uniform all over their area irrespective of distance, and proportional to the load factor or the number of hours per day that the power is being used.

PATENTS IN 1904.

The report of the Comptroller-General of Patents, Designs and Trade Marks for 1904 states that the applications accompanied by complete specifications were more numerous than in any previous year, and exceeded the number received in 1903 by 602, an increase of 9·1 per cent. The applications received in 1904 numbered 29,678, as compared with 28,853 in 1903, an increase of 825, or 2·3 per cent. Of these applications 22,442 were accompanied by provisional specifications, and 7,236 by complete specifications. On the other hand, the number of complete specifications filed after provisional specification was only 8,684, as compared with 9,187, a decrease of 503. The total number of specifications was 38,362, as compared with 38,019, an increase of 343, or ·9 per cent.

The most remarkable development is shown in the class rotary engines (including turbines), in which the general increase is 40 per cent., and the increase in turbines alone is more than double that amount. A marked growth appears also in the class air and gas engines, which has advanced to the extent of 27 per cent. The number of inventions relating to reciprocating steam-engines and to electric motors (class dynamo-electric generators, etc.), has also advanced, though to a less extent. The number of inventions for cycles continues to diminish, and is now less than one-fourth of the number for 1897, although the number of motor-cycles has increased 36 per cent., from the previous year, and is more than three times as many as in 1897. The number of wheels for vehicles has risen, although it is still only 40 per cent. of the number for 1897. Both road vehicles and railway and tramway vehicles have diminished, but locomotives etc., have increased slightly, owing to the development of motor-cars. About two-thirds of the whole number, and no less than 85 per cent. of the motor-cycles, are of British origin.

The rapid progress of the motor vehicle industry in this country is shown by the fact that the total number of British inventions has doubled since 1900, when less than one-half of the whole and only a little more than one-half of the cycles were of British origin. The oil or gas-engine type of motor finds most favour. Electricity receded as a medium of power for motor-cars and cycles. The activity in the motor-car industry still continues. The attention that is being given in engineering circles to turbines is significantly illustrated by the fact that more applications for patents were made for this class of motor than for all classes of reciprocating steam engines put together.

DUST ARRESTING RESPIRATORS.

INVESTIGATIONS BY THE SOCIETY OF ARTS

IN April, 1903, the Council of the Society of Arts announced that they were prepared to award, under the terms of the Benjamin Shaw Trust, a prize of a gold medal, or twenty pounds, for the best dust-arresting respirator for use in dusty processes, and in dangerous trades. The matter was referred to the Committee named below, which has now reported, and its report has been approved by the Council. It is with much regret that the Council find themselves compelled to adopt the conclusions of the Committee, and to withhold the offered prize.

The Committee consisted of Sir William Abney, K.C.B., D.C.L., D.Sc., F.R.S. (Chairman of the Council); the late Sir Frederick Bramwell, Bart., D.C.L., F.R.S., Mr. Michael Carteighe, F.C.S.; Mr. R. Brudenell Carter, F.R.C.S.; Mr. Henry Hardinge Samuel Cunynghame, C.B.; Professor Francis Elgar, LL.D., F.R.S.; the late Sir Clement Le Neve Foster, F.R.S.; Mr. Robert Kaye Gray; Colonel H. C. L. Holden, R.A., F.R.S.; Mr. Arthur Whitelegge, C.B., M.D., and Sir Henry Trueman Wood, secretary.

The report states that in response to the invitation which was issued in April, 1903, sixty applications were sent in by the date appointed. The following list shows the various countries from which these sixty applications were received :—

United Kingdom 27, India 2, Canada 1, Tasmania 1, Austria 6, France 3, Germany 6, Holland 1, Italy 2, Norway 2, United States of America 9. Total 60.

CONDITIONS.

Some of the competitors sent in apparatus, some models, some drawings, and some only descriptions. The following were the conditions which the apparatus was required to fulfil :—

1. It must be light and simple in construction.

2. It should be inexpensive, so as to admit of frequent renewal, of the filtering medium or of the respirator as a whole; or alternatively it should be of such construction that it can be readily cleaned

3. It should allow no air to enter by the nostrils or mouth except through the filtering medium.

4. It should not permit expired air to be rebreathed.

5. The filtering medium, though it should be effective in arresting dust particles, should not offer such resistance as to impede respiration when worn for some hours under the actual conditions of work.

6. It is desirable that it should be as little unsightly as possible.

After a careful examination of the various specimens sent in, the Committee found that they could be arranged under the following heads :—

A.—Respirators fitted with a valve.

B.—Arrangements for supplying air from a distance.

C.—Respirators of the nose-bag type, consisting of a pad of woven or fibrous material, sponge, etc., with or without a supporting frame.

D.—Casing with adhesive material to retain dust.

E.—Mouth and nose plugs, or arrangements to be held in the mouth.

F.—Devices in which the dust was arrested by centrifugal action during its passage through spiral or convoluted tubes.

G.—Miscellaneous, including an ozonizer, a frame fitted with electro-magnets, and an arrangement for keeping the dust from the mouth by means of a current of air blowing across the face.

It appeared to the Committee that all the apparatus of practical value was included in classes A and C. Many of these showed very great ingenuity, and a considerable number of them would certainly be effective in preventing the access of dust to the lungs. In most, however, the air passages were certainly insufficient, and their use in practice would, without doubt, be extremely exhausting to the wearer. There were, however, a smaller proporton of apparatus which were not so liable to this defect; but it did not appear to the Committee that any of the appliances could be worn during continuous labour without grave inconvenience to the worker. It would be difficult for them to justify this expression of opinion without a very long and elaborate series of physiological tests, which there would be some difficulty in making, and which, if made, would probably hardly repay the trouble and cost. On the whole, the Committee came to the conclusion that in none of the apparatus sent in was there sufficient originality to justify the award of a prize. At the same time they think they are justified in mentioning the following makers as having submitted apparatus, either of considerable practical use, or of appliances containing sufficiently novel suggestions, to make them worthy of consideration.

APPARATUS WORTHY OF COMMENDATION.

Apparatus which the Committee consider worthy of commendation was sent in by—

J. V. Détroye, Limoges.

Wallach Brothers, 57, Gracechurch Street, London, E.C.

Adolf Brauer, 1–1, Führichgasse, 7, Vienna.

Dr. Détourbe, 206, Boulevard Raspail, Paris.

R. Spasciani, Via Ansonio, 16, Milan.

G. F. Zimmer, C.E., 82, Mark Lane, London, E.C.

A. Rowley Moody, M.B., Richmond House, Shelton, Stoke-on-Trent.

C. J. Boyd Wallis, 21, St. James's Road, Tooting, London, S.W.

The first four of these are all wire mouth and nose masks, without valves. A typical construction is that of a simple muzzle made of wire gauze or perforated metal, doubled, with a layer of cotton wool, or other like material, placed between the folds. The four latter pieces of apparatus were of similar construction, but were all fitted with valves.

In addition to the above, two inventors sent in apparatus fitted with materials which appeared to the Committee to offer great advantages over cotton wool, or similar materials which were generally used. These were—

Dr. Feldbausch, Uferstrasse, 16, Heildelberg.

Julius Wolff, Schlichter-Strasse, 15, Wiesbaden.

POINTS FOR IMPROVEMENT.

Some comments on the selected apparatus are added in the hope that they may, by indicating the points which appear to the Committee defective, or at all events to admit of improvement, encourage the inventors to persevere until a thoroughly satisfactory apparatus may be produced.

The Committee think it necessary to say that they have not considered in any way questions of priority or originality, as to which they have had no evidence before them. Many of the commended pieces of apparatus showed considerable resemblance in construction and in details; but the Committee had no means of forming any opinion whatever as to who was the original inventor of any of these details, and they have, therefore treated the various pieces of apparatus entirely on what they consider to be their individual merits.

The Committee have had statements submitted to them in several cases which show that many of the pieces of apparatus submitted have been of great practical service. But as a matter of fact they were already aware of this, and it is a matter of common knowledge that masks, even though they may be of an extremely simple character, have proved to a certain extent efficient in protecting workpeople from various dusts. But it appears that no device has yet been produced which would fulfil the conditions laid down for the award of a prize—conditions which seem to the Committee to indicate the minimum of practical safety.

Under these circumstances they are unable to recommend that any prize should be awarded by the Council, and though it is with great regret that they find themselves brought to this conclusion, they trust that their labours may not be without a little value as indicating what is required, and demonstrating that the requirements they originally laid down yet remain unfulfilled

The Committee still recommend the problem to inventors. What is wanted is an apparatus that will arrest dust, and which can be worn by a man while doing hard work such as turning a lathe, without causing him to pant. It must also be cool and convenient.

SOME DEFECTS.

As a rule the great defect in the respirators hitherto proposed is that the air passages are not nearly wide enough. The apertures of the nose are enough for breathing during repose, but when work is being done the mouth must also be opened, and a wide and free passage made for the air.

The Committee believe that a total area of not less than 1½ square inches (say 10 square centimetres) of aperture is required.

NOTES ON THE APPARATUS COMMENDED.

WIRE MOUTH AND NOSE MASKS WITHOUT VALVES.

1. J. V. Détroye.—The metal is aluminium, pierced with eight holes to the square centimetre, of 25 millimetres diameter. Thus about one-third of the surface is left open. The arrestor is a layer of cotton wool, and the respirator covers both nose and mouth. It is fairly easy to breathe through, but being very close to the mouth and nose, has a tendency to get hot when in use. It is fastened on with elastic. A piece of rubber piping about 8 cm. in diameter, serves to fill the space between the edges and the face.

2. Wallach Brothers.—A very similar type, consisting also of cotton wool between two layers of aluminium. The holes and spacing here are much the same size as in Détroye's. The thickness of the pad of cotton wool is the same. The effective breathing area is the same, and the other general arrangements are very similar, with the difference that by the

more simple arrangement of the respirator there is only one pad of cotton wool instead of two, and the interior air space being bigger, there is less likelihood of its being heated by the breath. Both these respirators have much in their favour, except that they become unpleasantly hot even after a few minutes' use.

3. Adolf Bràuer.—This is also a small nose and mouth mask, consisting of two layers of wire, with a layer of cotton wool between them. The borders are made of aluminium. It is fastened on with india-rubber bands. But it has no india-rubber tube to fill the gaps between the edges and the face, hence unless pressed very tight it admits unfiltered air. The edges are rather too slanting, and do not adapt themselves well to the face. In fact, they require considerable bending about to adjust them. Added to this, the apparatus fits so tightly upon the nose and mouth that it soon becomes unpleasantly hot. The wire gauze is perhaps an improvement on the holes; the mask does not seem so well contrived, though its breathing area is larger. In all the above the cotton wool admits of easy replacement.

4. Dr. Détourbe.—Détourbe's mouth and nose mask is of a similar character to the above, except that instead of holes the front is crossed by aluminium bars on the outside, and thread on the inside. There is more room on the inside than in the last. The pad of wool is thicker and more effective. Possibly this mask would be improved if the cotton wool area were increased so as to cover the sides as well as the front. The cotton wool is easy to replace. The mask is bordered by a rim of felt instead of india-rubber. This is perhaps more durable, but would be likely to get very dirty. It could, however, no doubt be washed.

Another form has large eye-glasses attached. This is on the whole a good mask, and it and that of Wallach seem the best of their type. Both, however, would be improved if made larger and with a greater breathing area.

MOUTH AND NOSE MASKS WITH VALVES.

5. R. Spasciani.—This consists of a metal case of sheet aluminium. In the front of this are seven holes, each 1·2 centimetres diameter, thus giving a total breathing area of about eight square centimetres. Behind this is a sponge about ½ centimetre thick. The edging of the mask consists of a good thick tubing of some sponge composition. The mask is roomy inside. Like the others, however, it soon becomes hot. The outlet valve consists of a flat disc of aluminium resting on a seating If the face is bent down the valve does not fall properly on the seating. The valve, however, acts fairly well when the face is held vertically. It does not appear certain that this valve would not admit dust.

6. G. F. Zimmer.—This consists of a nosebag of india-rubber sheeting, with a celluloid cell in front filled with sponge. It is very like that of Spasciani except that it is heavier, and has two outlet valves. An india-rubber flap, which seems unnecessary, has been attached on the inside, like those of Moody and Wallis; a diaphragm runs across the centre interded to force the workmen to inhale through the mouth and exhale through the nose. It is rather difficult to understand the use of this. The sponge is of a coarse quality, and appears inadequate; it is edged with velvet.

7. A. R. Moody.—This consists of a celluloid muzzle, edged with a large, soft india-rubber cushion, which can be easily removed to be cleaned. A thick pad of cotton-wool is contained in a cell in the front covered with wire gauze, and with gauze at the back. Over this and at the back, a flap of india-rubber is placed to prevent the expired breath passing through the cotton-wool. The object of this contrivance is doubtful, it would be pretty sure in time to cockle up and cease to act, and the mask would appear better without it. The breath is expelled through three valves with india-rubber flaps, each ·9 centimetres in diameter.

8. C. J. B. Wallis.—This is of a type very similar to Moody's, but somewhat inferior in design. The cell is covered with a disc of celluloid with holes of inadequate size, and with a similar disc at the back. There are two expiration holes, each ·9 centimetres diameter, which seem insufficient for the purpose. They are covered with india-rubber flaps. The mask is edged with a removable pneumatically expanded cushion with a stop-cock.

MATERIALS.

9. Dr. Feldbausch.—Has an inadequate respirator, but with a rather interesting filter, consisting of a sort of mop like the mops used for cleaning test tubes, but with longer hair. This curious device seems to have a remarkable freedom in letting the air pass, and if it can arrest the dust it might be valuable. This part of the apparatus seems worth examination.

10. Julius Wolff.—To the respirator there is fixed, a curious filter apparently of hair cloth, with a layer of some sort of fibrous material behind it. This the inventor describes as Japanese flower paper. His filters allow air to pass with extraordinary facility, and may, perhaps, suggest the means of solving the problem.

OUR WEEKLY BIOGRAPHY.

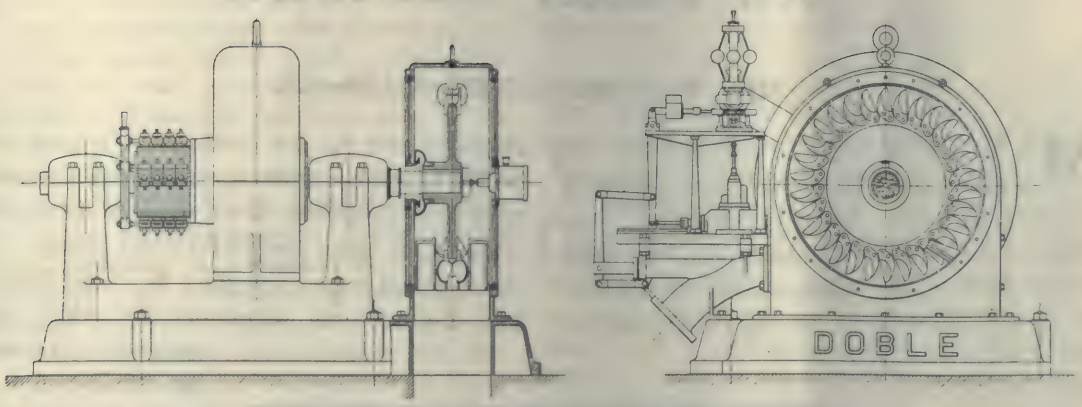
MR. WALTER JONES, M.I.Mech.E.

MR. WALTER JONES, the President of the Staffordshire Iron and Steel Institute, was born in 1846. His active business career began at a comparatively early age, for, owing to the death of his father, in 1866 he inherited the responsibilities of managership, and for the past twenty years he has been the sole proprietor of the engineering works of Messrs. Jones and Attwood, Stourbridge. Under his direction a notable increase in the productiveness of the firm was effected, and it was soon found necessary to erect new premises, a site for which, two acres in extent, was secured on the Amblecote side of the town. Mr. Jones is the patentee of a number of labour-saving devices, many of which were introduced into the mechanical equipment of his manufactory.

MR. WALTER JONES, M.I.MECH.E.

In 1874 he invented an improved expansion joint for which he was awarded the Midland Horticultural Society's medal; two years later he placed upon the market improved coils and radiators, for which he received the silver medal of the Worcestershire Agricultural Society. Among his succeeding inventions were, improvements in the methods of heating and ventilating public buildings; a combined throttle valve and expansion joint; patents for drying bricks, porcelain and terra-cotta goods by means of hot water, and the "W. Jones' Patent Pipe Cutter," the advantages of which are generally known. His latest and probably his most important invention is the new core forming machine which is patented throughout Europe, Canada and the United States.

For eighteen years Mr. Jones was a member of the Stourbridge Town Council, and for a period of four years he acted as chairman of the Urban District Council. He is a member of the Institution of Mechanical Engineers, and a past president of the Institution of Heating and Ventilating Engineers. In his workshops he has adopted the eight-hour day for his employees, who number over two hundred, and he takes a practical interest in all matters relating to their welfare. In addition to his well-known work, "Heating by Hot Water," Mr. Walter Jones is also responsible for some literature dealing with various aspects of civic life.



DOBLE TANGENTIAL WATERWHEEL WITH 100-KILOWATT GENERATOR.

THE DOBLE WATERWHEEL.

THE Doble hydro-electric unit—illustrated herewith—is of the two-bearing type, the waterwheel being mounted on the extended end of the generator shaft. The generator, waterwheel, cast-iron housing, and needle nozzle are carried on a heavy cast-iron sub-base securely imbedded in a concrete foundation. The waterwheel end of the base overhangs the tail-race pit, the latter being extended so as to give room for a by-pass pipe to enter and connect with a relief valve. This extended part of the pit has a cast-iron cover with a plate-glass centre, so that the wheel discharge and the action of the relief valve can be observed. The relief valve is provided so as to avoid an excessive pressure in case the water wheel nozzle is suddenly closed by the governor.

The wheel illustrates the standard construtions of the Abner Doble Company, of San Francisco. The design of the buckets, wheel-body, and nozzle is based on a factor of safety of at least 10, and the material used for these parts is tested as recommended by the International Association for testing materials.

In order that the action of the water on the buckets, as well as the perfect form of the jet issuing from the needle nozzle, may be observed at all times, the sides of the waterwheel housing are constructed of plate-glass. The buckets are gun-metal castings and are of the Doble patented ellipsoidal type, ground and polished on the hydraulic surfaces and sharpened to a knife edge on the dividing wedges and the entrance edges.

Owing to the form of the ellipsoidal bucket the jet of water enters without shock or disturbance and is discharged along natural lines over the entire bucket surface. The central portion of the front-entering edge or lip of the bucket is cut away in the form of a semi-circular notch, which opening allows the solid jet to impinge on the dividing wedge of the bucket without being split in a horizontal plane which would result in wastefully diverting part of the water unused down into the tailrace. By this form all eddy currents are avoided and as the full force of the jet is spent in doing useful work, the efficiency of the bucket is very high. The absence of eddy currents results in even wear and remarkable durability.

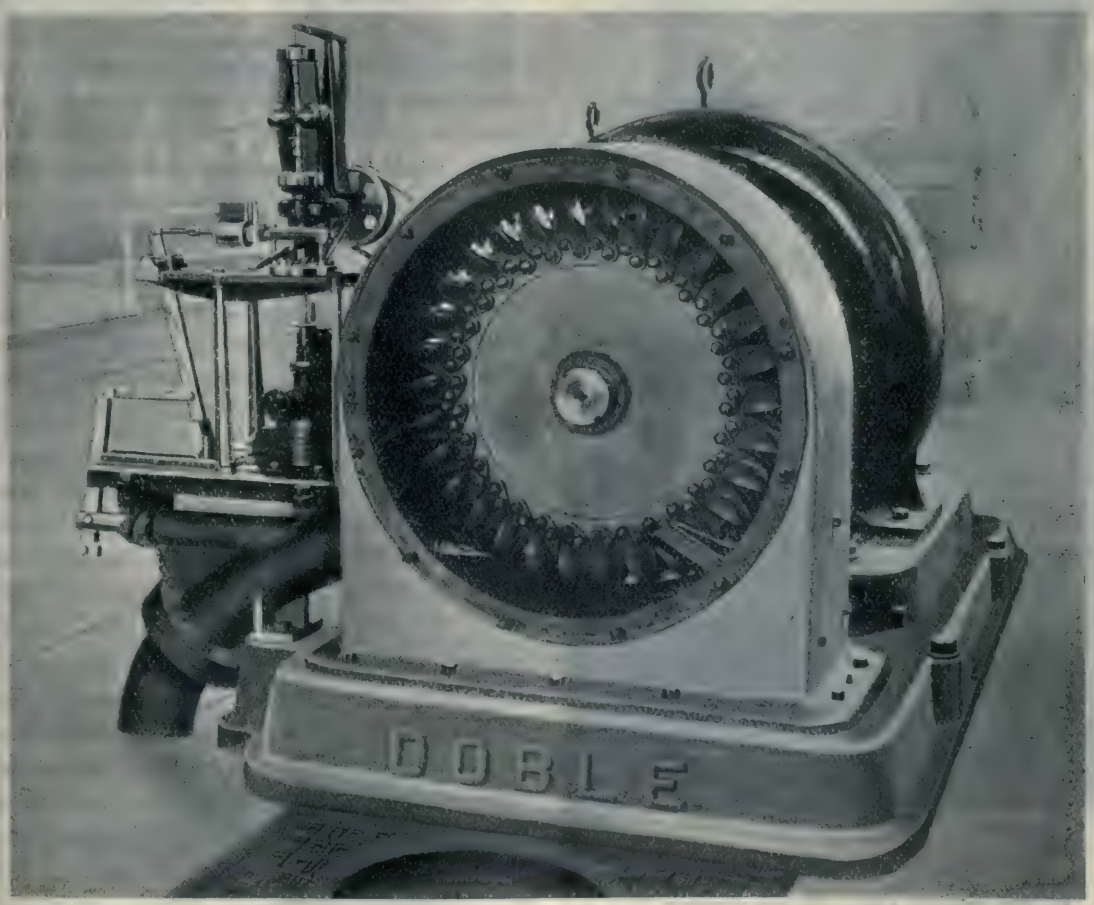
Each bucket straddles the rim of the wheel and the fastening lugs are milled to gauge on

a specially designed machine so that the bucket will accurately fit the wheel on the periphery and on both sides of the rim. The semi-circular notch and the dividing wedge of the bucket are milled in a jig so that all travel in the same plane. Each bucket is fastened to the wheel rim by two-body-bound steel stud bolts, fitted in reamed holes.

The milling and drilling of the buckets is done in jigs, and after all machine work is completed the buckets are brought to the same weight, so that they are interchangeable. The wheel is thus brought to a perfect balance, both statically and dynamically.

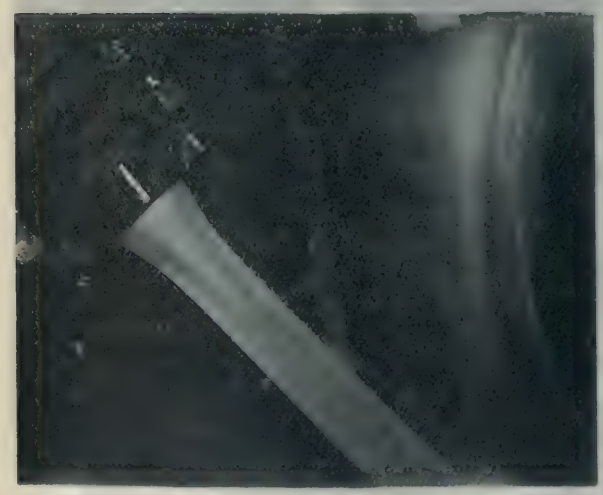
The wheel-body is a semi-steel casting finished all over and balanced. The rim is finished to template, the latter being the mate of the template to which the lugs of the buckets are milled. The hub is bored and keyseated to fit the generator shaft. The shaft of the generator extends beyond the bearing, the waterwheel being secured thereon by a steel nut with brass washer.

The nozzle is of the Doble patented needle regulating type, operated by a hydraulic governor directly connected to the needle stem. The speed regulation is done by moving an axial corepiece—the needle—in a longitudinal direction within the nozzle, thus changing the annular area of the orifice and the quantity



DOBLE TANGENTIAL WATERWHEEL, EQUIPPED WITH NEEDLE REGULATING NOZZLE.
170 H.P. ; 700 R.P.M. ; 700 FT. HEAD.

of water discharged. The nozzle produces a solid cylindrical jet, and investigation of this type, made at the Massachusetts Institute of Technology determined an efficiency as high as 99·3 per cent.



1. A DOBLE ELLIPSOIDAL BUCKET.
2. JET ISSUING FROM NEEDLE NOZZLE.

The main nozzle casting is made of semi-steel and after complete machining is subjected to a test of one and one-half times the working pressure for a period of five hours. The nozzle tip is detachable and consists of a steel forging, machined all over, the inner or hydraulic surface being finished to template and polished. The regulating needle is a steel forging machined all over, the needle bulb and point being finished to template and polished. The other end of the needle stem is provided with a counter-balancing plunger made of gun-metal, working through a cup-leather gland.

Instead of a stuffing box, there is provided in the opening in the back plate of the housing a patented centrifugal water guard, which prevents leakage from the housing, and at the same time ventilates it, thus permitting an easy discharge of the water into the tail-race. This water guard is of brass, machined and polished.

The baffle-plate, opposite the nozzle, inside the housing, serves to prevent water from being carried around by the wheel and also protects the housing in case the wheel should run over speed. It is a heavy iron casting, and is securely bolted to the housing.

One of these wheels was exhibited at the St. Louis World's Fair, being awarded the Grand Prize. The water, under the hydraulic pressure necessary was furnished by a duplex triple expansion mine pump, because no natural high head of water was available at St Louis. This pump supplied the water to the wheel under a pressure equal to a head of 700 ft., and had a capacity of 1,000 gallons per minute. The wheel was 31 in. in diameter, and was driven by a 1½ in. jet of water. It was directly connected to a 100-kilowatt railway-type generator, furnishing direct current at 500 volts to the feeder system of the Intramural Railway power plant. The operation speed of the unit was 700 revolutions per minute.

SHIPBUILDING NOTES.

ON Thursday, June 15th, 1905, the large steamer *Archbank* left Hartlepool for her trial trip in Hartlepool Bay, and after adjusting compasses had satisfactory runs over the measured mile, averaging a speed of 11¼ knots. Built by Messrs. Furness, Withy and Co., to the order of the Peareth Steamship Company, Ltd. (managing owners Messrs. Beckingham and Co., Newcastle-on-Tyne) the vessel is classed 100 A1 at Lloyd's, and is over 350 ft. in length. She is of the spardeck type, with poop, bridge and forecastle. The machinery, which worked exceedingly well, is by Messrs. Richardsons, Westgarth and Co., Ltd., Hartlepool. The sizes of cylinders are, 24 in., 39 in., 66 in., by 45 in. stroke; the boilers, 16 ft. by 10 ft. 6 in. long, giving a working pressure of 180 lb. After the trial trip the vessel left for Cardiff, to load under the command of Captain Milne. The owners were represented by Messrs. J. H. and C. L. Beckingham and Mr. Norman Burnett (superintendent), the builders by Mr. H. Withy, and the engineers by Mr. Urquhart.

On the 16th inst., Messrs. William Gray and Co., Ltd., launched the steel screw steamer *Midas* for Messrs. Gladstone and Co., of West Hartlepool. The *Midas* is a sister vessel to the *Cambyses*, recently launched by Messrs. William Gray and Co. for the same owners. She will take the highest class in Lloyd's, and is of the following dimensions: length overall, 361 ft. 6 in.; breadth, 46 ft.; and depth, 26 ft. 1 in., with extra long bridge, poop, and topgallant forecastle. Triple expansion engines are being supplied by the Central Marine Engine Works of the builders, having cylinders 24½ in., 40 in., and 65 in. diameter, with a piston stroke of 42 in., and two large steel boilers for a working pressure of 180 lb. per square inch. The ship and machinery have been built under the superintendence of Mr. Chas. Breckitt, on behalf of the owners, and the ceremony of naming the steamer was performed by Mrs. Frank Dixon, wife of Mr. Frank Dixon, a director of Messrs. Harris and Dixon, Ltd., London.

On Saturday, the 10th inst., the steel-screw steamer s.s. *Henry*, which has been built by Messrs. Osbourne, Graham and Co., of Hylton, was sent to sea for her official trial trip. This steamer has been built to the order of Mr. Otto Zelck, of Rostock, by the instructions of Messrs. H. G. Harper and Co., of London, who were represented at the trial trip by Mr. Petersen. She is built on the single-deck principle, with deep bulb angle frames, to Lloyd's highest class, and will carry 2,400 tons on a draft of 17 ft. 3 in. The engines, which have cylinders 19 in., 30 in., 50 in. by 36 in., with two large boilers, have been supplied and fitted by Messrs. Geo. Clark, Ltd., of Southwick, Sunderland. The trial trip was in every way satisfactory; a mean speed of 10 knots being registered.

The steel-screw steamer *Apollo* has been launched by Messrs. Furness, Withy and Co., Ltd., Hartlepool. This vessel has been built to the order of Messrs. Harris and Dixon, of London. She is over 350 ft. in length and has a cubic capacity of about 339,936 cubic feet. The hatches are of large size, and are worked by seven powerful steam winches. Wood shifting boards will be fitted throughout. Triple-expansion engines will be supplied by Messrs. Richardsons, Westgarth and Co., Ltd., Hartlepool, the sizes of cylinders being 24 in., 39 in., 66 in. by 45 in. stroke, with two single-ended boilers 16 ft. by 10 ft. 9 in. long, working at 180 lb. The christening ceremony was performed by Mrs. Frank E. Dixon, of London.

The turbine passenger steamer *Viking*, built at the Walker yard of Sir W. G. Armstrong, Whitworth and Co., to the order of the Isle of Man Steam Packet Company, and intended for the summer excursion traffic between Liverpool and Douglas, proceded, last week, upon her long-distance trials. The course selected was along the Durham and Yorkshire coasts from Souter Point, near the mouth of the Tyne, to Flamborough Head and back. The tide was about equally for and against the vessel, and she carried a load equivalent to her full complement of passengers, giving her a draught of about 11 ft. She ran continuously at full speed for six hours forty minutes, and maintained a mean speed of 23·53 knots for the course in and out. The three hours' run southward was performed at the rate of 23·68 knots, and on her return she touched 24 knots for some distance. The propelling machinery, supplied by the Parsons Marine Steam Turbine Company, consists of three sets of Parsons turbines, each driving an independent shaft. The two outside engines are low-pressure, and within their casings are fitted the astern-going turbines, which can give the vessel a speed of 14 or 15 knots. Steam at a pressure of 160 lb. to the square inch is supplied by four double-ended boilers, working under forced draught in enclosed stokeholds; these were made by the Wallsend Slipway and Engineering Company.

MINE SAMPLING AND ORE VALUATION.

By James Park, M.Inst.M.M.; M.A.Inst.M.E.; F.G.S.; Professor of Mining Geology, Otago University.

(*Continued from page* 1283.)

CALCULATING AVERAGE WIDTH AND VALUE OF VEIN.

THE assay-values may be expressed in pennyweights of gold per ton; percentage of metal; or, in the case of low-valued gold or bullion, the money-value may be stated in dollars or £ s. d. per ton. The thickness of the ore is most conveniently expressed in inches for veins up to 8 ft. or 10 ft. thick. Take the case of ten samples from a gold-bearing vein, as follows:—

No. of Sample.	Width of Vein in Inches.	Assay-value per Ton in Pennyweights.	Inch-dwt.
1	40	8	320
2	36	9	324
3	32	7	224
4	34	5	170
5	28	9	252
6	30	6	180
7	34	8	272
8	38	5	190
9	40	7	280
10	44	4	176
	356		2,388

The average width is found by dividing the sum of the widths by the number of samples. Thus, in this case we have $\frac{356}{10} = 35{\cdot}6$ in. average width.

The average assay-value is found by dividing the sum of the inch-dwt. by the sum of the widths as under: $\frac{2388}{356} = 6{\cdot}69$ dwt. per ton for a width of 35·6 in.

EXCEPTIONAL ASSAY-VALUES.

A sample giving an exceptional assay-value may be dealt with in different ways. It may be discarded entirely and not included in the average; for ascertain the average value with it included, and replace the original exceptional value by this average, and then calculate the average value for the average width. For example: Five samples gave values of 10 dwt., 20 dwt., 25 dwt., 120 dwt., and 25 dwt. per ton. The average is 40 dwt. Replace the exceptional value, 120 dwt., by 40 dwt., and then proceed with the calculation of results.

The exceptional value may represent a small patch of rich ore, or a bunch of rich ore increasing in dimensions going upwards or downwards, or even a solitary speck of gold. The most satisfactory manner of dealing with an exceptionally rich assay from a sample is to resample the vein a second time.

FUTURE PROSPECTS.

When satisfactory values have been obtained around a block of ground, the natural inference is that the area of ore is of the same approximate value. Experience has shown that where a block is exposed in four dimensions such inference is fair and reasonable. Where the block is exposed in three dimensions the inference may be open to some doubt. Before arriving at a definite conclusion as to the future prospects of the mine it is advisable for the examiner or mining engineer to carefully consider the following questions: (*a.*) Is there any change of rock-formation enclosing the lode in any part of the mine? If so, what influence does this change of country exercise upon the value of the ore? (*b.*) Is there any indication of barren zones of ore, either in depth or horizontal extension, along the course of the lode? (*c.*) Are the values in the zone of oxidation likely to be maintained in the unoxidised portion? (*d.*) What are the probabilities of impoverishment in depth?

SAMPLE VALUES AND MILL RETURNS.

Manifestly the assay-values obtained represent only the values of the actual material broken by the examiner. The variations of value obtained at the different intervals clearly emphasise the variable value of the ore. Hence the mean values deduced from the assay-values can only be regarded, even in the most favourable cases, as close approximations. A mining engineer with a personal knowledge of the ore and values in a mine extending over a considerable period, can often so adjust his averages by the experience of the past, as to make a very close estimate of the quantity and value of ore in newly developed ground in the same or adjoining mines.

The discrepancy that often exists between the sampler's estimate and the mill returns, in the case of gold-ores particularly, may be due to one or several causes, among which the following may be enumerated: (*a.*) A sudden increase of width of ore without a corresponding increase of values. (*b.*) A sudden decrease in values, or the payshoot may split into two legs and reunite between two levels. (*c.*) A greater proportion of mullock or rock is sent to the mill than was contained in the examiner's samples. This is a contingency very liable to occur in the breaking of a narrow vein in the stopes, especially where the vein is less in width than the width of the breast or face. In cases where the walls of the vein are well defined and the stripping easy, the proportion of rock introduced with the ore is not likely to be very great, especially where a stretch of ore is stripped before it is broken. (*d.*) Imperfect tally of the tonnage of ore sent to the mill. (*e.*) Inadequate allowance for moisture.

The sampling of a mine for valuation purposes is most exhausting, both physically and mentally. When the work has been carried out carefully and conscientiously the mine-examiner should be prepared to stand by his results. The examiner must remember that he is the confidential adviser of his principals, and for that reason must keep a discreet silence about the results of his examination, and of his opinion as to the probable value of the mine.

SAMPLING OF DUMPS OR PADDOCKS OF ORE.

The sack of ore is divided into a number of small blocks by two systems of cuts or trenches passing through the ore at right angles to each other.

(*a.*) Each block can now be sampled separately by picking pieces of ore from its four sides.

(*b.*) Or the material excavated from the trenches can be wheeled to a clean piece of ground, spawled into small pieces, mixed, and quartered repeatedly until a sample of convenient size is obtained. Before each quartering the larger pieces of ore must be broken to half their diameter in the preceding quartering.

(*c.*) Or the material from the trenches can be crushed in a rock-breaker, mixed, and quartered down till the assay sample is obtained.

SAMPLING HEAPS OF TAILINGS.

If the accumulation of tailings is large it should be sampled in separate sections, as large piles of sand are liable to vary considerably in value in different parts. Stake off the heap, so as to divide it into sections about 5 yards square. Make a diagram in field-book corresponding to sections. Record the dimensions of the sections, and distinguish each section by a letter, as A, B, C, etc. Sample each section, beginning with section A: (*a.*) With a sampling-iron take samples all over the section at, say, every foot or two. (*b.*) If there is reason to believe that the values are not the same from top to bottom, put the top material into one bag and the lower into another; or, if necessary, separate samples can be taken for every foot of depth. (*c.*) If there is no sampling-iron available, holes are dug at intervals of every 4 ft. or 6 ft. The sands from the holes are wheeled to a clean place, mixed, and reduced by quartering to a convenient size. If required, the sand obtained from different depths can be kept separate.

SALTING OF MINES.

By "salting" is meant the illegal enrichment of the ore, with the object of giving the property, a fictitious value. The mine-examiner should be familiar with the methods adopted by unscrupulous persons, so as to be able to protect the interests of his principals. A common method is to tamper with the examiner's samples; and for this reason the samples should always be in safe custody until the assay results are known.

Cases are known where the sample-bags have been enriched before the samples were put into them. It is therefore a wise precaution to keep the sample-bags in a lock-up sack until they are required. And even then it is advisable to turn each bag inside out and shake vigorously before use. In the case of gold-mines, soft ore has been artificially enriched to a depth of a foot or more with a strong solution of chloride of gold.

Fraud has been practised on mine-examiners by stretches of rich ore having been skilfully built into the wall of a level at different intervals and at the working face the joints being obscured by liberal splashes of mud. In the same way artificial outcrops have been prepared. Dumps of ore have been stacked with rich ore on the sides and top surface. An imposture of this kind is at once disclosed by the process of trenching when procuring samples for assay.

Samples of gold-wash intended for examination by panning have been enriched either before or during the washing, by the agency of gold-bearing tobacco-ash, pellets of clay, and gold-bearing finger-nails. The gold obtained from the panning of gold-wash or tailings should be examined under the microscope. Bulk samples of ore have been salted during the process of treatment in the battery, either by the addition of gold or amalgam.

The examiner's samples may be unlawfully enriched at any stage from the breaking of the material in the mine to the assaying in the laboratory. Strong solutions of gold-chloride have been injected into the bags with a syringe, and gold-dust added to the litharge and fluxes. Fraud is so easily practised in this stage that the examiner should either supply his own assay materials or test those placed at his disposal. In these days of mine-valuation by systematic sampling, cases of stacking or salting of the ore in the mine are rare, and easily circumvented by the watchful examiner. But, besides covert acts intended to beguile, the examiner may be misled by the suppression of important developments, or by the blocking-up of workings where unfavourable results might be obtained.

On his part the mine-examiner must take care not to assume an attitude of restraint and distrust towards those connected with the management. In the writer's experience, miners are as honest as most men; and if they sometimes put the best side before one, it is more from a feeling of loyalty to their employers than a deliberate desire to deceive. Probably not more than one in a hundred would wilfully mislead, or use unlawful means to enrich the samples. But the hundredth man is generally a clever rogue, and needs very close watching; and because of this one man it is necessary to take no risks, either in the mine or in the laboratory.

New Italian Single-phase Railway.

The French Westinghouse Company have recently secured the contract for the installation of the Westinghouse single-phase railway on the Bergama, Valle Brembana Railway, Italy. This is the second single-phase railway contract secured by the French Westinghouse Company in that country, the first being the Rome-Civita-Castellana Railway. Complete details are not yet to hand. The length of the line is 30 kilometres, and it will be served by five 30-ton locomotives equipped with four 75 h.p. Westinghouse single-phase motors, multiple unit control, and pneumatically operated bow trolleys. The gauge of the track will be 1·44 m. The power station is to be equipped with three single-phase 500-k.w. Westinghouse alternators, running at a speed of 500 r.p.m. There are to be no transforming sub-stations, and the line will be fed at the above pressure direct from the power house.

* New Zealand Mines Record.

THE LABOUR MARKET.

BOARD of Trade Statistics just issued show that compared with April, employment in May exhibited an improvement, and that as compared with a year ago there was an improvement in the metal, engineering and shipbuilding trades generally.

COAL MINING.

Employment in the coal mining industry in May was about the same as in April, and was slightly better than a year ago. At collieries employing 558,126 workpeople, the pits worked on an average 4·93 days per week during the four weeks ended May 20th, 1905,* as compared with 4·93 days in April, 1905,* and 5·09 days in May, 1904.

IRON MINING.

Employment was good and showed little change compared with a month and a year ago. At the 120 mines and open works covered by the returns received from employers, the average number of days worked per week during the four weeks ended May 20th was 5·85, as compared with 5·71† in the previous month and 5·90 in May, 1904.

IRON AND STEEL MANUFACTURE.

Employment at iron and steel works continued good and was considerably better than a year ago. Returns relating to 195 works, employing 88,267 workpeople, show that the volume of employment in the week ended May 20th, 1905, was 0·2 per cent. greater than a month ago, and 5·9 per cent. greater than in May, 1904.

The average number of shifts remained about the same as a month ago, the greatest difference being a decline in crucible furnaces. Compared with last year the only decrease took place in the Bessemer Converting Department. The largest increases were in crucible furnace sand forging and pressing.

Department.	Numbers employed in week ended			Average Number of Shifts worked per man in week ended		
	May 20th, 1905.	Apr. 15th, 1905.	May 21st, 1904.	May 20th, 1905.	Apr. 15th, 1905.	May 21st, 1904.
Open-Hearth Melting Furnaces	7,268	7,376	6,957	5·88	5·91	5·80
Crucible Furnaces	590	567	556	5·61	5·72	5·39
Bessemer Converters ...	2,105	2,091	2,033	5·15	5·23	5·30
Puddling Forges	9,539	9,431	9,436	4·88	4·88	4·81
Rolling Mills	29,249	29,440	28,207	5·22	5·21	5·15
Forging and Pressing ...	3,808	3,804	3,601	5·36	5·49	5·38
Founding	11,129	10,961	10,822	5·81	5·88	5·78
Other Departments	7,248	7,215	6,453	5·78	5·69	5·64
Mechanics and General Labourers	17,330	17,197	16,393	5·74	5·76	5·69
Total	88,267	88,082	84,458	5·48	5·48	5·40

* The figures for April and May, 1905, are reduced by holidays.
† Reduced by Easter holidays.

PIG IRON INDUSTRY.

Employment in this industry continued to improve during May, and was considerably better than a year ago. Returns relating to the works of 108 iron-masters showed that 322 furnaces, employing about 22,900 workpeople, were in blast at the end of May—an increase of three furnaces as compared with the previous month, and of 14 as compared with May, 1904. These increases were confined to England and Wales, the number of furnaces in blast in Scotland being the same in all three periods.

The following Table shows by districts the number of furnaces in blast at the works included in the returns in the three periods specified :—

Districts.	Number of Furnaces, included in the returns, in Blast at end of			Increase (+) or Decrease (−) in May, 1905, as compared with	
	May, 1905.	April, 1905.	May, 1904.	A month ago.	A year ago.
ENGLAND & WALES—					
Cleveland	85	84*	77	+ 1	+ 8
Cumberland & Lancs.	35	35	34	...	+ 1
S. and S.W. Yorks.	15	14	13	+ 1	+ 2
Derby & Nottingham	36	36	37*	...	− 1
Leicester, Lincoln, and Northampton	28	27	25	+ 1	+ 3
Stafford & Worcester	31	30	32*	+ 1	− 1
S.Wales & Monmouth	15	15	13	...	+ 2
Other districts ...	6	7	6	− 1	...
Returned from England & Wales	251	248*	237	+ 3	+14
Returned from Scotland	71	71	71	...	...
Total furnaces included in returns	322	319*	308	+ 3	+14

ENGINEERING TRADE.

Employment generally showed an improvement on the previous month, and was considerably better than a year ago. The percentage of trade union members unemployed at the end of May was 5·2, as compared with 6·0 at the end of April, and 6·6 per cent. at the end of May, 1904.

SHIPBUILDING TRADES.

Employment showed some recovery in May after the falling off reported a month ago, and is now at about the same level as at the end of March. As compared with a year ago a more marked improvement is shown. The percentage of trade union members unemployed at the end of May was 11·1, as compared with 12·2 at the end of April, and with 13·1 per cent. a year ago.

OBITUARY NOTICES.

THE LATE MR. JAMES MANSERGH.

ALTHOUGH the news of the death of Mr. James Mansergh could not have been wholly unexpected, the announcement came as a great shock to his many friends, and to that far larger circle comprising the members of the profession of which he was so long a distinguished member. He had during the greater part of his career largely devoted his abilities to questions affecting water supply and sewage disposal, but this was to some extent an accident of occupation, and there is little doubt that he would have won distinction in any other branch of civil engineering with which he might have chosen to identify himself. Indeed, it was only chance that prevented his becoming known as one of our great contractors rather than a civil engineer, and he has been heard to humorously lament the fact that he had not chosen to make a fortune in the carrying out of work rather than win a modest competence in the character of a designer.

THE LATE MR. JAMES MANSERGH.

Mr. Mansergh was seventy-one at the time of his death, having been born in 1834, and he left a record of nearly sixty years' work behind him. His birthplace was Lancaster, and at the age of fifteen he was apprenticed to the firm of Messrs. McKie and Lawson in his native town. The firm, during his pupilage, was engaged in a good deal of important work, and young Mansergh had an excellent opportunity of acquiring an insight into several branches of engineering, notably in connection with water works and railway construction. At the age of twenty-one he went out to Brazil as contractor's engineer and district agent, being one of four employed on the first section of the Dom Pedro II. railway, which was intended to form a link between Rio de Janeiro and the interior. He remained in Brazil for some years, and was practically the sole survivor of the four young engineers associated with the work, for two of them died of yellow fever, and the third was invalided home. Returning to England, he became a partner with his former principal Mr. McKie, and it is of interest to note that in the early days of this partnership they laid out the first sewage farm in England at Carlisle. The partnership, however, was dissolved in 1860, and Mr. Mansergh became contractor's agent for John Watson and Co., with whom he remained for three years, his energies during this period being occupied with Cambrian railways. It is said that the great Birmingham water scheme originated in his mind during his work in Wales at this period.

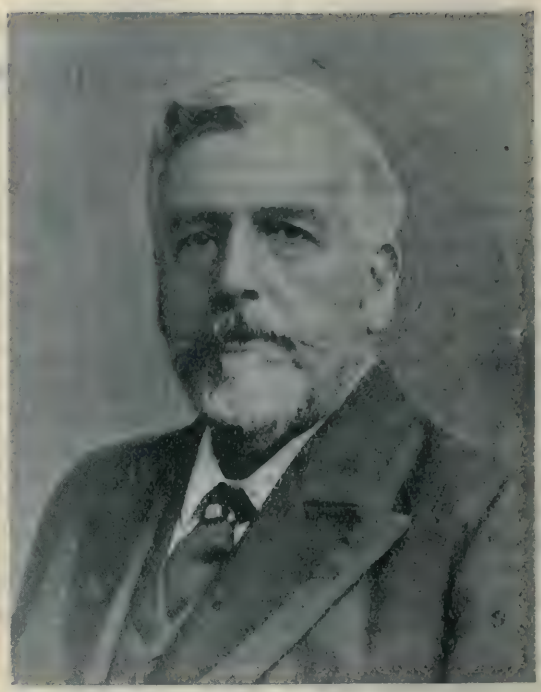
He finally entered into partnership with his brother-in-law Mr. John Lawson, in association with whom he carried out a number of important works in England. Mr. Lawson, however, died in 1873, and since then, either alone or in partnership with his sons, Mr. Mansergh has been almost continuously engaged in designing water or drainage schemes for important towns and cities at home and abroad. His last great work was in connection with the Birmingham water scheme. This scheme, it will be remembered, is a most comprehensive one. The water is brought to Birmingham from the valleys of the Elan and Claerwen, seventy-three miles distant, and will ultimately provide a supply of 75,000,000 gallons of water daily, in addition to 27,000,000 gallons for compensation. The portion of the scheme completed includes four great

dams holding back the waters of the Elan, and the base of the dam at Dolymynach on the Claerwen, and the aqueduct to convey the water from the storage reservoir near Rhayader to the service reservoir at Frankley. Mr. Mansergh did not live to see the full completion of the great work he designed for Birmingham. This, however, is only one of several great projects in which James Mansergh played a leading part. In 1889 the Victorian Government consulted him with regard to a complete sewerage scheme for Melbourne, a work dealing with an area of 133 square miles, as compared with 119 square miles, the area of the County of London, and it was one of the most comprehensive schemes of the kind ever designed.

It was only natural that Mr. Mansergh should have been a member of Lord Balfour's Committee on London Water Supply, and from the outset he was a strenuous advocate of the combination of the eight metropolitan companies. He was also sole engineering adviser of the Local Government Board in connection with the London Water Transfer Bill. Before committees of the House of Commons he was a familiar figure, having given evidence many hundreds of times.

One of the most famous fights before Committee in which he was engaged was in connection with the Stockton and Middlesbrough Waterworks in 1876, this being the first instance of the compulsory purchase of a water company's undertaking by a municipality.

His profession recognised the abilities of James Mansergh, and such honours as were theirs to bestow were granted with no ungrudging hand. He became President of the Institution of Civil Engineers in succession to Sir Douglas Fox in 1900, and his occupancy of the chair of the premier engineering institution was distinguished by the fact that the Engineering Standards Committee was then formed, and Mr. Mansergh became Chairman, a post which he continued to occupy until the day of his death. The value of the work done by the Engineering Standards Committee is now well known, and it has so extended in scope and influence that at the present time there are no fewer than thirty sub-committees working in connection with it. In addition to his presidency of the Institution of Civil Engineers, Mr. Mansergh was a member of the Council of the Institution of Mechanical Engineers, and in 1901 was accorded the well-deserved honour of a fellowship of the Royal Society. One field into which men of his eminence and abilities generally make some incursion—that of technical authorship—was left untouched by Mr. Mansergh, but his work will stand as a fitting memorial to the things he has accomplished.



By courtesy of the Surveyor.]

THE LATE MR. CHARLES H. LOWE.

THE LATE MR. CHARLES H. LOWE.

THE news of the death of Mr. Charles H. Lowe, late borough engineer and surveyor of Hampstead and past-president of the Incorporated Association of Municipal and County Engineers, has been received by a large circle of friends with great regret. Mr. Lowe was born in London sixty-five years ago, and it was in the Metropolis that his whole business career was spent. After completing his education at Geneva he was articled to Mr. Charles Broadbridge, architect and surveyor, receiving his first appointment as a clerk to the surveyor of Marylebone in 1859. At a later date he became assistant surveyor, and discharged his duties with such conspicuous ability that it became clear he would go far in the profession he had adopted. One important scheme with which Mr. Lowe was associated was the opening up of the Harrow Road, which was carried out from his plans by the Metropolitan Board of Works at a cost of £150,000. In 1871 he received the appointment of surveyor and engineer of the Hampstead Vestry, and continued in that office for thirty years, carrying out many important public works during his long connection with this important district. Mr. Lowe was a member of the Institution of Civil Engineers and of the Surveyors' Institution.

AMERICAN NOTES.

THE PANAMA CANAL.

SPEAKING at a dinner of the Bankers' Club, in Chicago, of the difficulties to be encountered in connection with the Panama Canal, Mr. T. P. Shonts, president of the commission, said that to overcome the physical difficulties or to safeguard against them was their first duty. They had begun by removing stagnant ponds, constructing sewerage, and installing modern plumbing in the dwellings of those engaged in the work. The disease-breeding pestholes and marshes had been kerosened to protect against insects and sickness. All of the old dwellings to be used had been fumigated and thoroughly renovated and made more fit for human habitations. After health conditions and the question of sanitation on the isthmus, came the question of labour. Where to secure competent labourers was one of the questions they must settle before they could begin in earnest. The results of transplanting American labour to the torrid zone had been uniformly disastrous. It was necessary, therefore, to go to the neighbouring countries for their labour, for workers who are accustomed to the climate. After this problem was solved, what then? They would have to excavate millions of cubic yards of material. They must control the waters of a river, convert miles of swamps into rock-walled rivers, and construct a commodious harbour in the open sea. The fourth problem was to overcome the difficulty arising out of the great distance of the isthmus from their base of supplies. To keep the materials and labour in perfect balance with one another could only be accomplished by the most perfect organisation and complete system of advices. This was where the French failed, because of a lack of system and method of communication.

MR. CARNEGIE'S ENGINEERING GIFT.

Plans have been filed for the new fifteen-storey building, to cost £975,000, which Mr. Andrew Carnegie is to present to the Associated Societies of Engineers. It is to be erected on the premises, No. 25 to 33 West 39th Street, New York. Adjoining it in the rear and occupying the plot Nos. 32 and 34 West 40th Street, will be the thirteen-storey club-house, which is to cost an additional $375,000, and which is also part of Mr. Carnegie's gift to the engineers. The 39th Street building will be a fireproof structure, 212 ft. high, with a frontage of 115 ft. and a depth of 88·9 ft. It is to be one of the French Renaissance style, and will be lighted by five rows of tall decorated windows, panelled in bronze. The entrance will be adorned with giant doors of decorated bronze, and will be flanked by columns supporting bronze candelabra. Three ornamental balconied doorways, with bronze doors, built just above the entrance cornice, will be flanked by statuary, and the roof cornice and its frieze will be supported by a series of engaged columns and pilasters rising from the 13th storey. The façade is of granite and limestone, trimmed with terra cotta. The main floor of the building is to have a great entrance hall, and opening off it at the corners will be the administration office, the smoking-room, the reception-room, and a writing-room. The third and fourth storeys will contain an auditorium, with a balcony, and having spacious promenades on the north and south. The fifth floor will be fitted with smaller assembly halls and the sixth floor will contain a series of lecture rooms. The seventh to the eleventh floor, inclusive, will be devoted to offices, as follows: seventh and eighth floors, associated societies; ninth floor, mining engineers; tenth floor, electrical engineers, and eleventh floor, mechanical engineers. The library will occupy the thirteenth and fourteenth floors.

BELT CREEP.

An interesting subject dealt with by Mr. Wm. W. Bird, at the Scranton meeting of the American Society of Mechanical Engineers, was that of belt creep. The question of the minimum amount of slip of a belt in transmitting power from one pulley to another, reduces itself to a question of creep, for it is possible to have belts large enough so that with proper tensions there will be no regular slip. With a difference in tension on the two sides and elasticity in the belt, creep however is bound to take place. What does it amount to and what allowance should be made for it? The author's answer to this question is that "for a common leather belt running under ordinary conditions the creep should not exceed 1 per cent. While this is sometimes called legitimate slip, it is an actual loss of power and cannot be avoided by belt tighteners or patent pulley coverings."

THE TANTALUM LAMP.

Among the papers presented at the Denver meeting of the National Electric Light Association, was a report by Dr. Louis Bell and Professor W. L. Puffer,

on the Tantulum incandescent lamp. The lamps, as tested, showed the following characteristics :—

Lamp.	Watts.	C.P.	Watts per Candle.
Clear globes ..	41·58	21·42	1·94
	38·61	20·90	1·84
	41·58	24·93	1·66
	41·58	21·55	1·93
Frosted globes ..	41·91	21·81	1·92
	41·91	22·59	1·85
	40·36	19·79	2·03
	40·34	18·54	2·15
	40·04	18·74	2·13
	40·48	19·27	2·09

The mean result from the clear globes was 22·2 candle-power at 1·85 watts per candle-power ; that from the frosted globes 19·08 candle-power at 2·1 watts per candle. It is interesting to note that the clear lamp gives just about 1 candle-power per inch of incandescent filament, which implies an intrinsic brilliancy of somewhere about 500 candle-power per square inch of filament—a figure much higher than in the ordinary incandescent. As illuminants the lamps are certainly very excellent, but their introduction raises some most interesting questions for the central station operator, which are dealt with at length in the Electrical World, of New York. It is remarked that, putting aside all the petty questions that will be raised about the new lamp for commercial reasons, the broad fact remains that we are here dealing with a *bona fide* 2-watt lamp having a life fairly comparable with the carbon filament lamps now customarily in use. Moreover, it is a competitor of these, socket by socket, and not as a substitute with particular requirements as in the case of the Nernst lamp, or the very small arcs. There is some doubt as to the life of the tantalum lamp when exposed to unusual vibration, which may perhaps bar it in some special locations, but for the everyday work of the central station there is good reason to believe it generally applicable. The unexpected has certainly happened, for most engineers had long ago abandoned the idea of a lamp with a metallic filament. Only the discovery of a metal virtually new and possessed of most sensational qualities could have brought about the present striking result.

The Exploitation of Ore Deposits in Russia.

Mr. Chas. Francis de Nevers, M.Am.Soc.C.E., sends to the Engineering News a graphic account of his experiences in Siberia and Russia, where he has been acting for an American company engaged in the developments of iron deposits. In the first place, he says, all Russian business is more or less subject to military rule, and thereby very much hampered. Nothing whatever can be done in carrying on business except by the sanction of a military official of some rank, and corruption among these officials is rampant in every grade. As a result, Russia is permeated through and through with graft. In Siberia the situation is, if possible, worse. There, if you raise objection to the autocratic grafting of officials, your liberty, and even your life is not secure. There have been many inquiries as to the condition of the Trans-Siberian Railway.

I have seen very poor railways in Africa, but I have never seen a permanent way in such a disreputable state as that of the Trans-Siberian. Not even at important stations have attempts been made to keep it in proper shape. When you see the road in such bad repair, while piled along the track is enough material to build a double track over the entire length, and you see this very material falling into decay and rust without any attempt to prevent it, it sets you wondering. The explanation is given in one word : Graft. The country through which the Trans-Siberian passes is very rich in minerals, but no other than Russian subjects have the right to exploit the riches of the mines. I located rich mines of brown hematite, and also mines of anthracite coal, near Maripol, toward the Manchuria line. A little way north-west I located a very rich and important deposit of gray hematite. By heavily bribing the then governor of this province I obtained for my firm the authorisation to exploit these ore deposits, but the exorbitant demands of this man and other functionaries compelled us to stop.

MECHANICAL ENGINEERS' MEETING.

(*Continued from page* 1341.)

The arrangement, states the author, lends itself to the free expansion of the jacket and inside cylinders, which are only solid at the one end. As the cylinders are open their supervision and upkeep are as easy as in the case of an ordinary single-acting engine. The governor acts on the admission. The valve, with a constant stroke, always opens at the same place, but closes later or sooner, so as to effect the admission of variable charges with constant composition of mixture.

DIFFICULTIES YET TO BE OVERCOME.

It is advisable before closing this paper on the new motive power which utilises every kind of fuel gas produced commercially, to point out the principal difficulties which remain to be overcome in order to enable large engines working with poor gas in general to work with safety, facility of control and upkeep; such attributes appear to have remained the special feature of the steam-engine. Economically the gas engine is evidently superior, but low consumption is not the only quality which users require from a motive power. It is necessary above all that it should be free from the risk of sudden stoppages, which lead to great expense, as they hamper production, and may be at times fatal in certain industries where breakdowns must be specially avoided; such is the case with electric stations, pumping, hoisting, and ventilating work in mines, etc. The principal causes of breakdowns in engines fed by gas other than town gas, which undergoes a complete purification, consists in the fouling of parts, such as the pipes, the valves, and the cylinder, by impurities in the gas.

In large installations where it is extremely important to avoid breakdowns, recourse is had to special means of washing and purifying, by the use of centrifugals and other apparatus. But although these succeed in reducing to $\frac{1}{8}$ gramme per cubic metre the amount of dust accompanying the gas, they still allow the passage of tar, which is the principal element destructive to the engine. This tar adheres to the sides of the passages, causes the valves and piston rings to stick, thus preventing their proper action. It also deposits itself in the cylinder, where it finally gives rise to premature ignitions. Certain coke-oven gases contain as much as 1 gramme of tar per cubic metre.

THE TAR PROBLEM.

It is this very question of tar which compels us, in order to avoid great complications, to employ exclusively non-caking anthracite coal for suction

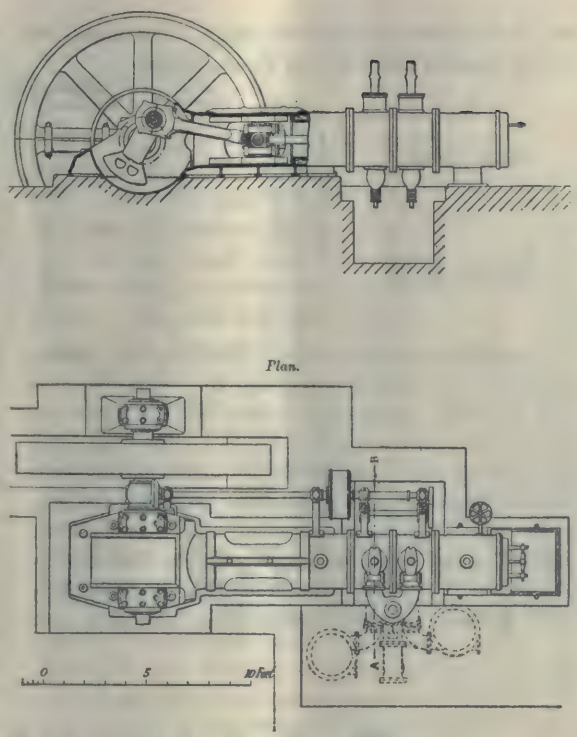


FIG. 8. DINGLER GAS-ENGINE.

gas producers, now so largely in use owing to their simplicity and economical efficiency. As tar is a product of distillation of the volatile carbons (carbides) which escape on combustion and on the conversion into fuel gas, it is the better plan to deal with them in the producer itself. Different systems have been proposed, amongst which is the system of inverted combustion, which is said to have the result of burning the volatile matters as they are given off, and the distillation of the hydro-carbons in the independent reducers. It must be admitted that so far the efforts of the inventors have not met with the success expected. The caking of the fuel and the formation of cavities injurious to the regularity of combustion constitute the principal difficulty to combat. The use of bituminous coal, especially in suction gas producers, is not, therefore, a question which has been industrially accomplished.

Whether it is producer gas, blast-furnace gas, or coke-oven gas, which is used, its purity is an important factor in the proper working of the engines which it feeds. The organic defects of large engines do not appear to play in this respect a preponderating part. They should, however, be perfected as regards facility of access and upkeep of the parts, such as valves and piston. The oil consumption should be low,

and they should be made less susceptible to variations in the quality of the gas. The skill of our experts and our makers will, we have no doubt, soon overcome these latter difficulties. Large gas-engines will then constitute one of the most remarkable industrial victories of the age in which we live.

SUPERHEATERS IN LOCOMOTIVES ON THE BELGIAN STATE RAILWAY.

M. J. B. Flamme, Inspector-Général de l'Administration des Chemins de Fer de l'Etat Belge, Brussels, read a paper with this title, of which the following is an abstract :—

The Belgian State Railway has recently put in service a series of simple-expansion locomotives, the boilers of which carry a pressure of 14 atmospheres (205·8 lb. per square inch), with an inside diameter of 1·600 metres (5 ft. 3 in.), while that of the cylinders is 520 millimetres (20½ in.). This class of engine gives the maximum power obtainable by the simple-expansion of steam. In fact, every new enlargement of the cylinders would demand larger dimensions for the crank-axle and moving parts ; on the other hand, the necessity for clearing the loading-gauge limits the diameter of the boiler ; in short, with simple-expansion it would be difficult to utilise steam with a pressure exceeding 14 atmospheres. Under these conditions, and in view of further increasing the power of the engines, it becomes necessary to resort to some other system for increasing the useful work of the steam without enlarging the existing boilers. The two solutions under consideration are compound working and superheating of the steam. Arrangements for producing superheated steam and the results obtained with a system that has been in service for more than a year will now be considered.

SCHMIDT SUPERHEATER FOR SIMPLE-EXPANSION LOCOMOTIVES.

It was in 1900 that the administration of the State Railways opened negotiations with M. Schmidt, the German expert.

A superheater, established in the barrel of the boiler, appeared to offer some real advantages. It is lighter, less cumbersome, easy to clean and maintain, and its introduction does not necessitate any important modifications in the smoke-box. Consequently, it was this kind of apparatus that the locomotive department adopted in a new type of powerful locomotive then being built in the Cockerill Works at Seraing.

At the same time, another important question presented itself. Was it absolutely necessary to superheat the steam to a temperature reaching 300 degrees to 350 degrees C. (572 degrees to 662 degrees F.) ? After several months of experiments it has been recognised that the utilisation of steam slightly superheated does not offer any appreciable economy of fuel or increase of power.

On the other hand, with the Schmidt apparatus placed on a locomotive (figs. 1 and 2), and provided with steam with a temperature varying between 300 degrees and 350 degrees C. (572 degrees to 662 degrees F.), some favourable results have been obtained.

The locomotives compared, one using saturated steam and the other superheated steam, are both of type 35, with six coupled wheels of 1·600 metres (5 ft. 3 in.) with bogie in front.

The superheater consists essentially of two parts, a series of iron tubes of 118 millimetres (4⅝ in.) external diameter, occupying the upper part of the nest of tubes and offering like them a passage for flame and hot gases. Some U-shaped tubes grouped in pairs among the flame tubes are used for the circulation of the superheated steam. A steam collector in several divisions is placed on the top of the smoke-box. Some supplementary parts complete the system. There must also be a diaphragm to close the flame tubes when steam does not circulate in the superheating tubes. This diaphragm is handled by the aid of a lever near the engine-driver. A mercury thermometer shows the temperature of the superheated steam at the entrance of the steam-pipe. The degree of superheat is read on a graduated quadrant placed in the cab.

RESULTS OF EXPERIMENTS.

The large flame-tubes, which are of solid drawn iron, are screwed into the firebox tube-plate and expanded in the smoke-box tube-plate.

The superheating tubes, also of solid drawn iron, are protected against the action of the flame at the fire end by cast-steel caps.

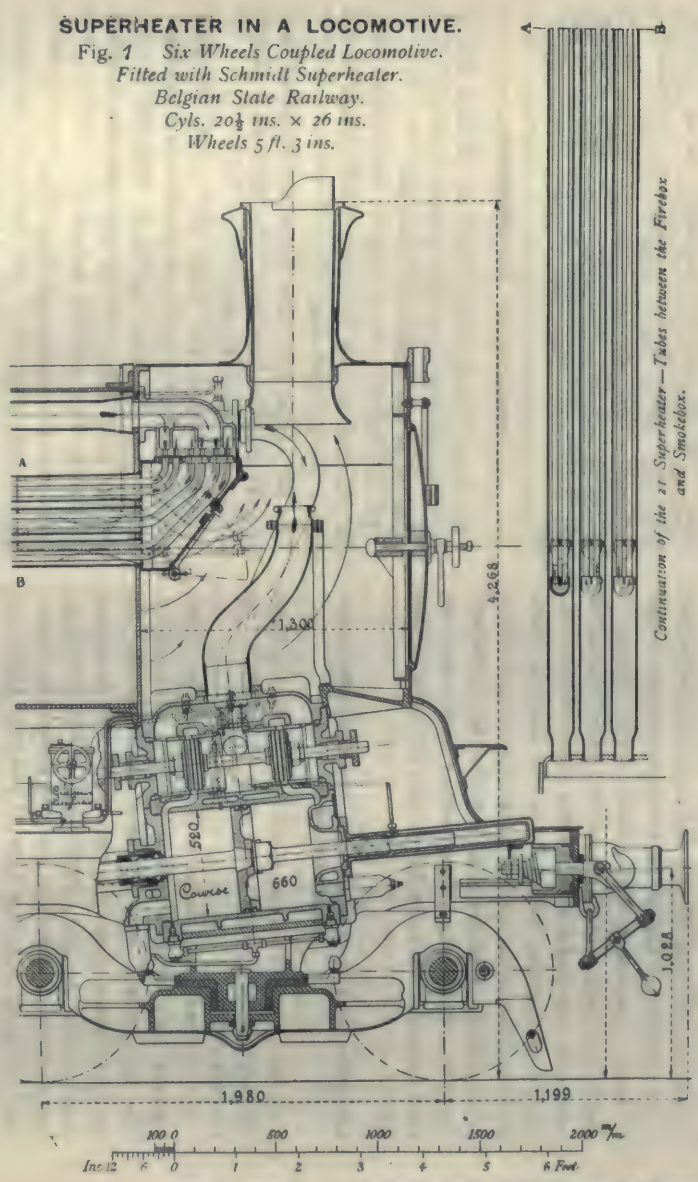
In the smoke-box these tubes are expanded into flanged bushes fixed by bolts. The tightness is assured be means of asbestos joints.

Copper, bronze, and brass are usually excluded from all parts that come in contact with the superheated steam. For this reason the steam pipes are of iron, and the joints between these pipes and the cylinders are formed with cast-iron flanges.

The metallic packings of the piston-rods and valve-spindles are composed of cast rings and white metal, the contact of which on the rod is obtained by a spring permitting small side movements of the rod.

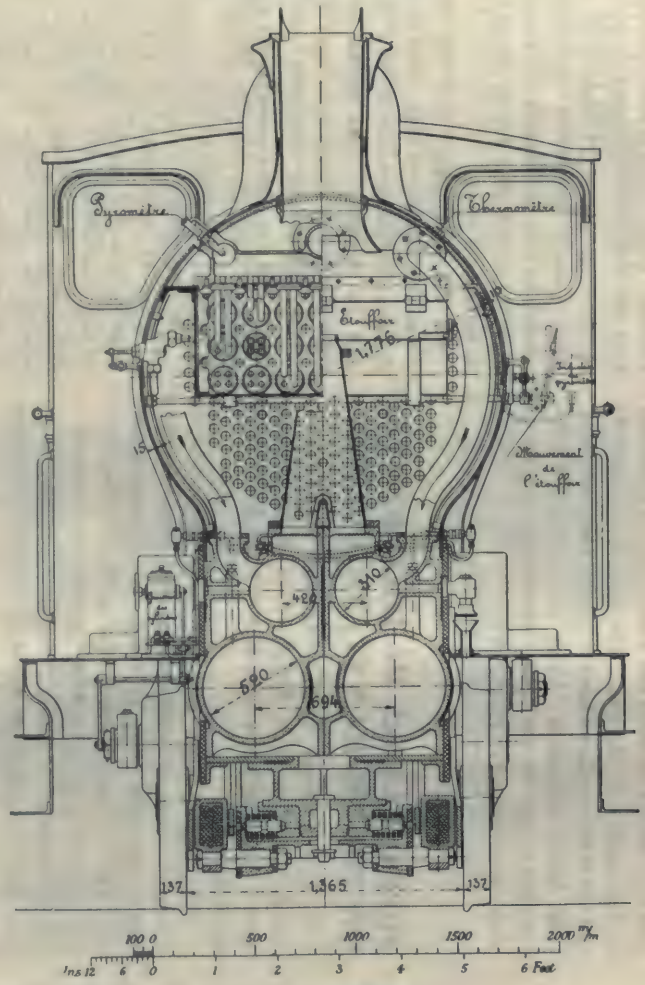
SUPERHEATER IN A LOCOMOTIVE.

Fig. 1 *Six Wheels Coupled Locomotive.*
Fitted with Schmidt Superheater.
Belgian State Railway.
Cyls. 20½ ins. × 26 ins.
Wheels 5 ft. 3 ins.



SUPERHEATER IN A LOCOMOTIVE.

Fig. 2. *Six Wheels Coupled Locomotive.*
Fitted with Schmidt Superheater.
Belgian State Railway.
Section through Smokebox.



FIGS. 1 AND 2, ILLUSTRATING THE PAPER ON SUPERHEATERS IN LOCOMOTIVES BY MONS. J. B. FLAMME.

The slide-valves are cylindrical with steam admission in the middle of the valve, which reduces the packing to simple bronze rings with lubricating grooves. The slack between each valve and the cylindrical chamber against which it rubs is closed by means of three cast-iron rings of suitable section, the steam pressing on the interior of the principal segment.

The oiling of the cylinders and valves is done by a lubricator in six sections. The lubricant used is a mineral oil with a high flash point.

Experiments were organised with the through passenger trains on the Brussels and Charleroi line, which has a series of inclines of 13 per 1,000. For ten days, during which the climatic conditions remained invariable, these two locomotives hauled alternately the same train of 250 tonnes (246 tons). The saving in favour of the superheated locomotive amounted to 12·5 per cent. for fuel, and 16·5 per cent. for water. Moreover, the speed raised at the top of the incline showed an average increase of 9·5 per cent., all the conditions being exactly the same. As regards maintenance the superheated-steam locomotive, type 35, has required no special attention during its 1½ year's service.

These early favourable results have led to the Belgian State Railway venturing on the application of superheat to locomotives on a larger scale. With this in view twenty-five locomotives, comprising five different types, all provided with the Schmidt superheater described above. are actually in course of construction or are about to be put to work.

Amongst these last are a certain number of locomotives of type 35, which have fully confirmed the favourable results obtained by the first engine of this kind. Among the number of services actually and successfully run by these engines is to be particularly noted the hauling from Brussels to frontier, of express trains going to Paris. These trains, whose tare weight of vehicles exceeds 340 tonnes (334⅝ tons), surmount the 17 kilometres (10·56 miles) separating Mons and the frontier in 17 minutes, against a continuous up-grade with inclines varying from 1 in 125 to 1 in 55.

(*To be continued.*)

THE FILING OF ENGINEERING CATALOGUES.

THE filing of engineering catalogues is by no means the easy matter which at first sight it would appear to be. The extraordinary variety in size in the first place is calculated to play havoc with the most carefully thought out scheme. The following recommendations on this subject are made by Mr. Bayliss G. Lee, in a paper read before one of the American technical associations: Arrange catalogues according to size, which will give about four classes. Allot to each size or class, numbers to twice the quantity of catalogues. If you have fifty catalogues of a size allot 100 numbers, thereby giving ample room for growth or additional accumulation of this size. Your numbers will then start at one and run to fifty. Your next size will start at 100 and run forward. This class will have 125 or 150; therefore you will allot numbers up to 300. You will only have about three classes in which you can arrange for the catalogues to stand, and the numbers can be very easily read. The smaller catalogues or pamphlets will then be placed in binders. These will then bear numbers the same as the catalogues. In other words, you allot to one size of your catalogues one to 100; another size, 200 to 300, another size 300 to 400 or 500, and to your binders 500 to 600. You, of course, use sufficient numbers to accommodate fully the quantity of your different catalogues. Then get a wide, full-size index with as much room as possible. List these catalogues alphabetically and allow the number of the catalogue to follow the name. In your

binders where in some cases you have three or four or a dozen pamphlets or small catalogues, you will list them just the same as your catalogues and show the binder number. By a little contact, you soon learn after referring to your index that catalogue number 50 is found in a certain class; catalogue number 200 is another class, which class is represented by the dimension of the catalogue.

In my office I have two large cabinets with adjustable shelves and sliding doors. It is only a second's work to obtain the very book you desire. These binders are inexpensive and you cannot appreciate how valuable they are in taking care of small pamphlets that are so easily misplaced.

As it is not always convenient to remember the name of the manufacturer of some particular catalogue and sometimes for the purpose of comparison you want to use the catalogues of several manufacturers, we arrange an index which we call an index of articles. We go through these catalogues very carefully and index each article manufactured, stating after the article the name of the maker and the catalogue or binder number. For instance, under H we have "Headlights"; opposite this we have the Handlan and Buck Manufacturing Company; following this will be 26, the catalogue number. In many instances you will have a double index, as there are some particular lines you would like to designate by class—for instance, "Track Tools." You follow this with Atha Tool Company, No. 40. You know that track tools comprise track gauges, lining bars, claw bars, mauls, etc., and at the same time, for absolute certainty, we give each one of these a double index by registering under T for "Track Gauges" and under G for "Gauges —Track," under which is also listed "Gauges —Steam." The same way with the bars. Claw bars will come under C and lining bars under L; but under "Bars" you have both claw and lining bars. All this may appear superfluous, but for handy reference and to prevent overlooking our hand at any time either with new assistants or old ones that have grown negligent in our service, we surround ourselves with every protection by the little additional work which requires to be done but once.

The discount sheets in my opinion should be kept entirely to themselves. For this purpose we have a portfolio alphabetically arranged, in which they are placed alphabetically, and as we receive new discount sheets we remove the old ones. These discount sheets are checked occasionally and when we feel they are required we make application for revised sheets.

The system that I have outlined carries with it no fixed expense. It is always complete, provided the catalogue is replaced in its class when finished with. If it is not, but is put into some of the other classes, it would be very noticeable, as the book would either be larger or smaller than the books that surround it.

BOLIVIAN RAILWAY PROJECTS.

IN a recent Foreign Office report H.M. Consul at La Paz remarks that as the Government has the firm intention to develop the country by the construction of railways, in which event the necessary material would be needed, this will be an opportunity for the furtherance of trade. British manufacturers would do well to send their catalogues in the Spanish language, indicating weights, measures, prices, discounts, and every possible detail, as is done by competing countries. Another very important step that should be taken by manufacturers of mining machinery and tools of every description is that of the establishment of depots or agencies at Oruro, the most important mining centre, and at Antofagasta, the port for same. German firms have representatives at the above-mentioned places, and they supply the most immediate needs of the mines, thus securing a good portion of the trade. It is also desirable that all machinery should be made in sections in order to facilitate its transport by mule back, as the roads in the country are very rough and hilly and consequently do not permit the traffic of carts. The weight of any package should not exceed 350 lb. Mining and all other machinery comes into the country free of duty.

CONTRACTORS' NEWS.

We shall be pleased to insert under this column, free of charge, particulars of open contracts

CONTRACTS OPEN.

Last Day.

Shenfield (near Brentwood).—Construction of pumping stations, sewers, and filtration beds in the district of Shenfield, near Brentwood, for the Billericay Rural District Council, Council's engineers, Messrs. Jones, Parliament Mansions, Victoria Street, Westminster .. June 24

Manchester.—Supply of the iron and steel work required for supporting an existing retort-house floor at their Rochdale Road gas station, for the Gas Committee. Mr. C. Nickson, superintendent, Gas Department, Town Hall ... ... June 24

Edinburgh.—Construction of an inclined retort carbonising plant to design, specification, and schedule of quantities prepared by their engineer, for the Edinburgh and Leith Corporations Gas Commissioners. Mr. W. R. Herring, M.Inst.C.E., chief engineer and manager, New Street Works, Edinburgh ... ... June 26

Ilford.—Erection of a dust destructor of six cells, viz., cells, flues, dustchamber, and boilers, for the Ilford Urban District Council. Mr. Herbert Shaw, A.M.Inst.C.E., engineer and surveyor, Town Hall, Ilford, Essex... ... ... June 26

London.—Supply, delivery, and erection of the following plant in connection with their electricity generating station at Park Royal, for the Great Western Railway Company: (Specification 18) pipework, feed and other pumps, tanks, feed heaters, water-softening and oil-separating plant, etc. Messrs. Kennedy and Jenkin, 17, Victoria Street, London, S.W. ... ... June 26

Aberdeen.—Supply of permanent way materials, including steel rails and guard rails, steel fishplates and steel fishbolts, and rail clips for the dock railway. Mr. R. Gordon Nicol, harbour engineer's office, Aberdeen ... ... June 26

Belgium.—The State Railways Administration invite tenders for the construction of a viaduct, with steel superstructure, at Felny-Arquennes station. The cost of the first section of the work is estimated at £923, and of the second section at £3,374. "M. de Rudder, Administrateur des voies et travaux, 11, Rue de Louvain, Brussels." ... ... July 12

Last Day.

Southampton. — Supplying and fixing three weighbridges at their depots, for the Corporation. Mr. J. A. Crowther, borough engineer ... ... June 27

Bangor (Ireland).—Supply, delivery, and erection at the Bangor gasworks of a rotary scrubber-washer, capable of dealing with 350,000 cubic feet of gas per 24 hours, including extension to present shafting for driving, 10-in. diameter connections, by-pass, and other valves, for the Urban District Council. Mr. James Milliken, Town Clerk, Town Hall, Bangor, co. Down ... ... June 27

Leigh (Lancs.).—Supply of one water-tube boiler for the Electricity Department. Mr. Arthur T. Smith, electrical engineer, Town Hall, Leigh ... ... July 1

Barking.—Removal of an old existing outlet sluice in the Thames river walling at Horse Shoe Corner, Barking; and for the construction of a new outlet sluice and works in connection therewith on or near the site of the old sluice, for the Essex Sewers Commission. Mr. A. Havelock Case, M.Inst.C.E., Broad Sanctuary Chambers, Westminster, S.W. ... ... July 3

Shoreditch.—Extension of plant at Whiston Street Station, including provision of two 1500 k.w. steam turbo generators, condensing pumps, piping, etc. Borough Electrical Engineer, Coronet Street, N. ... July 18

South Australia.—The Supply and Tender Board Office, Adelaide, will receive tenders until August 9th next, for the supply of the following materials, delivered in bond, on wharf, Port Adelaide: 30 mild steel boiler plates; 30 best mild steel smokebox tube plates for flanging (five drawings, 1s. each); 2 best mild steel firebox back casing plates for flanging; 20 best mild steel firebox throat plates for flanging; 14 copper tube plates flanged (3 drawings, 1s each); 25 copper wrapping plates; 385 engine and tender tyres (18 drawings, 1s. each); 104 best steel straight axles (2 drawings, 1s. each); 208 cast steel wheel centres (2 drawings, 3s. each); 258 carriage and wagon tyres (2 drawings, 1s. each); 20 best steel straight axle forgings (1 drawing, 1s. 6d.); 500 mild steel plates (1 drawing, 1s.) 60 bars convex iron (1 drawing, 1s.); 144 smooth surface panel plates; 1 hydraulic swing jib crane (1 drawing, 2s.). Specifications may be seen at the office of the Agent-General for South Australia, in London ... ... Aug. 9

COMING CONTRACTS.

Halifax.—A special meeting of the Town Council have considered a proposal to construct a line of tramways from the terminus at Salterhebble to the Calder and Hebble Inn, at an estimated cost of £6,400.

Maidstone—The amended scheme for the new outfall sewage works has been accepted by the Drainage Committee. The estimated cost for the work is £83,000.

Burnley.—The Corporation have decided to extend the gasworks at an estimated expenditure of £23,000.

Keswick.—A proposal is being put forward for a sewerage scheme at a cost of £8,000, and sanction is to be sought for power to raise this sum.

Tipton.—An inquiry has been held into an application of the District Council for sanction to borrow £3,000 for gasworks purposes.

Stalybridge.—An enquiry has been held into an application by the Council for sanction to borrow £15,873 for a refuse destructor.

Radstock (Somerset).—An inquiry has been held into the applicatron of the District Council in reference to a waterworks scheme.

CONTRACTS CLOSED.

London.—The Brush Electrical Engineering Company, Ltd., have secured orders for four double-deck carbodies mounted on radial trucks, for the Scarborough Tramways; five motor coach bodies, 13 trailer coach bodies with trucks and air brake gear, four spare trailer trucks for Great Northern and City Railway; and 50 sets of tramcar lifeguards for Belfast Corporation.

Leeds.—Hudswell, Clarke and Co., Ltd., of the Railway Foundry, Hunslet, Leeds, have secured an order for four locomotives of a special design, for a Central American railway.

Japan.—To the five thousand railway wagons which have been ordered by the Japanese Government, Cravens, Ltd., will supply a thousand sets of wheels and axles, and Sheffield will supply nearly all the steel required for the order.

Glasgow.—Richardsons, Westgarth and Co. Ltd., of Hartlepool, have recently received through their Glasgow agents, Messrs. A. R. Brown, McFarlane and Co., Ltd., an order from the Bent Colliery Company for a Contraflo surface condensing plant to deal with 40,000 lb. of steam per hour.

Ashton-under-Lyne.—The Corporation have accepted the tender of Dick, Kerr and Company, Ltd., for six single-deck cars.

Edinburgh.—The Scottish Central Electric Power Company have placed a contract with Bruce, Peebles and Company, Ltd., for extensions of generating plant, condensers, switchboards, etc., at the price of £17,000.

Burton-on-Trent.—The Corporation have accepted the tender of E. Bennis and Company, Ltd., for four Bennis machine stokers and self-cleaning compressed air furnaces.

Durham.—Bruce, Peebles and Company, Ltd., have received a contract for complete equipment of 9,000 h.p. generating station for Durham Collieries Electric Power Supply Company.

Spain.—The Chain Belt Engineering Company, Derby, have secured an order from the Alquife Mines and Railway Company, Spain, for an unusually heavy conveyor and elevator for handling iron ore briquettes.

APPOINTMENTS VACANT.

London County Council.—The London County Council invites applications from fully competent engineers with good experience in the design and construction of the permanent way and general arrangement of electric tramways on the conduit system (if possible) and on the overhead system. Salary £7 per week. Clerk of the Council, County Hall, Spring Gardens ... ... June 27

West Ham.—Principal for Technical Institute under the Education Committee. Salary, £500. Particulars from the Town Clerk ... ... —

Handsworth.—Electrical engineer to the Urban District Council. Salary £350 per annum. Mr. H. Ward, clerk, Council House, Handsworth... ... ... June 30

London.—The governing body of the Northampton Institute, St. John Street Road, London, E.C., invite applications for the following appointments: Drawing office and lecture assistant, pattern maker and instructor in pattern making, junior drawing office instructor, laboratory demonstrator for engineering laboratories, junior technical assistant and evening instructor in automobile work, also junior technical assistant and junior lecture assistant in the electrical engineering department. Particulars and forms of application from the principal, Dr. R. Mullineux Walmsley ... ... June 29

Durban.—Boiler superintendent in the Corporation Electric Power Station. Salary £250 to £300 per annum. Messrs. Webster, Street and Co., agents, 5, East India Avenue, E.C. ... ... July 4

APPOINTMENTS FILLED.

Keighley.—Mr. J. W. Bamber, of Halifax, has been appointed manager of the Keighley Corporation tramways.

Richmond (Surrey).—Mr. L. Paton Greig, borough electrical engineer of Bury St. Edmunds, has been appointed engineer to the Richmond Electric Light and Power Company, Ltd.

Australia.—Mr. Jno. Hesketh has been appointed electrical adviser to the Federal Postal Telephone Department.

Erith.—Mr. A. Coveney, engineer and manager of the Ashton-under-Lyne tramways, has been appointed manager of the Erith Urban District Council's electric tramways.

Share List of Engineering, Electrical, Iron and Steel, and other Companies.

The following is a comprehensive list of Companies in the industries covered by "Page's Weekly," in which shares business is being currently transacted. Additions will be made from time to time as occasion requires. We desire it to be understood that while our Share List will generally be found correct, we do not hold ourselves responsible for any loss or inconvenience that may arise from possible inaccuracies.

STOCK EXCHANGE SETTLING DAYS.—Settling days on the Stock Exchange are as follows :—

Consols : July 5th, Aug. 3 General Settlements June 29th, July 13th and 28th. Bank Rate, March 9th, 1905, 2½ per cent.

I.—ENGINEERING, IRON, AND STEEL COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
11,370	5	5%	Alldays & Onions Pneumatic Engineering, Ltd.	3	2⅝— 2⅞
10,000	5	3/-	Do. Cum. Pref. 6 per cent.	5	4¼— 4⅜
3,210,000	1	1/-	Armstrong (Sir W. G.), Whitworth and Co., Ltd.	1	3 3/16— 3 5/16
76,970	5	2/-	Do. 4% Cum. Pref.	5	5⅜— 5⅝
1,500,000	100	4%	Do. 4% 1st Mort. Dbs. Rd.	100	104 —106
£100,000	100	4½%	Aveling and Porter, Ltd., 4½% Reg. Mt. Debs. Red.	100	96 — 99
530,000	1	2/4⅔	Babcock and Wilcox, Ltd., Ord.	1	5¼— 5½
100,000	1	7½d.	Do. ,, 6% Cum. Pref.	1	1 1/16—1 1/16
20,000	5	3/-	Baker (Joseph) and Sons, Ltd., 6% Cum. Pref.	5	4⅜— 5⅛
250,000	1	6¾d.	Baldwins, Ltd., 5½% Cum. Pref.	1	1 — 1⅛
£250,000	Stk	4½%	Do. 1st Mt. 4½% Deb. Stk. Red.	100	103 —105
150,000	1	2/8⅔	Barrow Hæmatite Steel Co., Ld., O.	4½	1 3/16— 1 5/16
50,000	4½	3/-	Do. do. Cum 2nd. Pref.	4½	4⅛— 4⅜
33,334	5	2/6	Bayliss, Jones and Bayliss, Ltd., 5% Cum. Pref. Shares	5	4¾— 5⅛
£500,000	100	—	Beardmore (Wm.) & Co., Ltd., 4½% 1st Mt. Debs., Red., Scrip 50% pd	—	104 —106
50,000	10	6/-	Bell Brothers, Ltd., 6% Cum. Pref.	10	12 — 12½
£366,600	Stk	4%	Do 4% Deb. Stock, Red.	100	100—102
200,000	1	1/-	Beyer, Peacock and Co., Ltd., Ord.	1	15/16—17/16
300,000	1	6¾d.	Do. 5½% Cum Pref.	1	1⅛ — 1⅜
£300,000	Stk	4½%	Do. 4½% Red. Deb. Stock	100	96 — 99
1,629,760	1	6d.	Bolckow, Vaughan and Co., Ltd., O. Nos. 1-1,629,760	1	31/32—1 1/32
1,860,900	1	3⅜d.	Do. Nos. 1,639,101-3,500,000	12/-	⅛— 1/16
1,160,000	1	4¼d.	Brown (John) and Co., Lim., Ord., Nos. 1-1,160,000	15/-	1⅜—1⅝
590,000	1	6d.	Do. Ord., Nos. 1,160,001-1,750,000	1	1⅜ — 1⅝
74,000	10	5/-	Do. 5% Cum. Pref.	10	11½— 11⅝
154,500	5	5/-	Cammell, Laird & Co., Ltd., Ord.	5	8⅜— 8⅝
232,500	5	2/6	Do. 5% Cum. Pref.	5	5 3/16— 5 5/16
450,000	1	1/2⅔	Clayton & Shuttleworth, Ltd., Ord.	1	15/16— 1
70,000	5	2/6	Do. 5% Cum. Pref.	5	5⅜— 5⅝
£250,000	Stk	4%	Do 4% 1st Mort. Db. Stk. Red	100	101 —103
100,000	10	7/6	Consett Iron Co., Ltd., Ord.	7½	31 — 32
57 031	10	10/-	Crossley, Bros., Ld., Ord. 40340/97370	10	15⅞—16
40,339	10	5%	Do. 5% Cum. Pref.	10	11½—11⅞
75,000	1	2/6	Delta Metal, Ltd. Shares	1	2⅜— 2⅝
1,259,594	1	3¾d.	Dorman, Long & Co., Ltd.	1	⅞— ⅞
£400,000	Stk	4%	Do. 4% 1st Mort. Perp. Deb. Stk.	100	89 — 93
200,000	5	3/-	Dunderland Iron Ore Co., Ltd., 6% Cum. Pref. and Participating	5	2⅜— 3½
250,000	1	9¾d.	Dunlop (James) & Co., Ltd., Ord.	1	⅞— ⅞
300,000	1	7½d.	Do. 6% Cum. Pref.	1	⅞ - 1
4,721	13	12/-	Ebbw Vale Steel, Iron & Coal Co., Ltd.	13	9½— 10½
69,754	13	12/-	Do. do. do.	10	7½— 7⅝
20,250	10	8/-	Elliott's Metal, Ltd.	8	4⅜— 5½
5,000	10	5%	Do. Cum. Pref. 5%	10	3½— 9⅜
186,748	Stk	4%	Do. Deb. 4%	100	92 — 94
25,000	10	6/-	Fairfield Shipbuilding & Engng. Co., Ltd., 6% Cum. Pref.	10	11 — 12
£250,000	Stk	4½%	Do. 4½% Mort. Deb. Stk. Red.	100	100 —103
9,000	10	10%	Fleming & Ferguson, Ltd. Ord. Nos. 1/9000	10	12½—12½
6,000	10	5%	Do. 5% Cum. Pref. Nos. 9001/15000	10	9½—10
126,000	3	3/-	Fraser & Chalmers, Ltd., Ord.	3	4½— 4⅝
21,000	3	1/6	Do. 7½% Cum. Pref.	3	5⅜— 6½
10,000	10	5%	Galloways, Ltd., 5% Cum. Pref. 18001/28000	10	6 — 7
£150,000	Stk	4%	Do. 4% 1st Mort. Deb Red.	100	90½—91½
16,800	10	—	Greenwood & Batley, Ltd., Ord.	10	4¼—5½
9,600	10	7%	Do. 7% Cum. Pref.	10	10½— 10⅝
965,000	1	1/-	Guest, Keen & Nettlefolds, Ltd. Ord.	1	2⅜—2 5/16
344,000	5	2/6	Do. 5% Cum. Pref.	5	6⅜— 6⅝
£1,850,500	Stk	4%	Do. 4% Irred. Mort. Deb. Stk	100	105 —107
13,000	5	2/6	Gwynnes, Ltd., 5% Cum. Pref.	5	2 — 3
250,000	1	3/6	Hadfield's Steel F'dry Co., Ld., Ord.	1	3⅜— 3⅝
20,000	10	4/6	Do. 4½% Cum. Pref.	10	10⅜— 11¼
80,000	5	3/-	Hall (J. & E.), Ltd. 6% Cum. Pref.	5	5 — 5⅛
408,505	1	1/6	Harvey United Steel Co., Ltd.	1	1 3/16—1 5/16
47,500	10	7½%	Hawthorn, Leslie & Co., Ltd. Ord.	10	99— 101
28,001	5	7/-	Head, Wrightson & Co., Ltd.	5	5 — 5⅛
85,000	1	7½d.	Hill (Richard) & Co. (1899) Ld., Ord.	1	1 1/16— 1 1/16
18,000	5	3/-	Do. 6% Cum. Pref.	5	4⅜— 5
£100,000	Stk	6%	Hornsby (Richard) & Sons, Ld., Ord. 6% Cum. Pref.	100	98—100*

ENGINEERING, IRON, AND STEEL COMPANIES.—*Contd.*

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
750,000	1	7½%	Howard & Bullough, Ltd., Ord.	1	1⅜— 1⅝
25,000	10	6/-	Do. 6% Pref. (Non-Cum.)	10	13 — 13½
£250,000	Stk	4%	Do. 4% Deb. Stk., Red. after 1905	100	97 —100
37,500	10	20	Kynoch, Ltd.	10	18½— 19
49,587	10	5%	Do. Cum. Pref. 5%	10	10⅞— 11⅛
300,000	1	4⅛d.	Lambert Bros., Ltd., Ord.	1	⅞— ⅞
50,000	5	2/9	Do. 5½% Cum. Pref.	5	4 — 4½
40,000	3	2/11⅔	Leeds Forge Co , 7% Cum. Pref.	3	3½— 4
200,000	1	7½d.	Lysaght (John), Ltd., 6% Cum. Pf.	1	1 5/16— 1 7/16
£300,000	Stk	4½%	Do 4½% 1st Mt. Deb. Stk., Red.	100	109 —111
40,000	10	5/-	Mather & Platt, Ld., 5% Cum. Pref	10	11½—11⅝
210,000	1	8¼d.	Measures Bros., Ltd., Ord.	1	⅞— ⅞
75,000	1	6¾d.	Do. 5½% Cum. Pref.	1	1⅜— 1⅜
£75,000	Stk	4½%	Do. 4½% 1st Mrt. Db. Stk., Red.	100	92 — 95
21,943	5	2/6	Muntz Metal, Ltd.	5	4⅞— 5⅛
14,248	5	5%	Do. Pref. 5%	5	4⅞— 5⅛
5,000	62½	47/6	Nantyglo and Blaina Iron Works, Ltd., 8% Cum. Pref.	62½	79 — 81
78,000	10	5/-	N. Brit. Loco. Co., Ltd., 5% Cm. Pf.	10	12⅜—12⅝
80,000	5	—	North-Eastern Steel Co., Ltd., 4½% 1st Mrt. Db. Stk., Red.	100	90 — 93
£250,000	Stk	4½%	Pearson & Knowles Coal and Iron Co., Ltd., Ord., "B"	5	3⅞— 4⅛
122,000	5	1/6	Do. 6% Cum. Pref. "A"	5	6⅛— 6⅜
50,000	5	3/-	Pease & Partners, Ltd., Ord.	10	9½— 10
70,000	10	6/-	Do. 4% Perp. Deb. Stock	100	97 —100
£400,000	Stk	4%	Peebles(Bruce) & Co., Ld., 6% Cm. P.	5	5 — 5⅛
20,000	5	3/-	Pooley (Henry) & Son., Ltd., Ord	1	6/- — 6/6
65,000	1	—	Do. 5½% Cum. Pref.	5	4 — 4¼
13,000	5	—	Projectile Co. (1902), Ltd., Ord.	1	⅜— ⅜
280,000	1	—	Rhymney Iron Co., Ltd.	5	1⅝— 1⅞
126,938	5	2/-	Do. New	5	1½— 1⅝
73,062	5	2/-	Do. 5% Mort. Deb., Red.	100	102 —104
£380,000	—	5%	Richardsons, Westgarth & Co., Ltd., Ord. 320,001—700,000	1	25/32— 27/32
350,000	1	7½d.	Do. 4½% Perp. Deb. Stock	100	95 — 97
£350,000	Stk	4½%	Ruston, Proctor & Co., Ltd.	10	9½— 10
85,000	10	12/-	Scott (Walter) Ltd., Ord.	1	1⅜— 1⅝
275.000	1	6d.	Do. 6% Cum. Pref.	1	⅞— 1
300,000	1	7½d.	Do. 4% Perp. Deb. Stk.	100	94 — 96
£300,000	Stk	4%	Shelton Iron, Steel and Coal Co., Ld. 1st Charge 5% Debs. Red	100	93 — 96
£115,300	100	5%	Do. 6% 2nd Mort. Debs., Red.	100	94 — 98
£97,900	100	6%	South Durham Steel & Iron, Ltd. Or.	1	29/32— 31/32
250,000	1	1/-	Do. 6% Cum. Pref.	1	⅞— 1⅛
300,000	1	1/2⅔	Do. 4½% Per. Deb. Stock	100	90 — 92
£300,000	Stk	4½%	Steel Co. of Scotland Ord. 1/49560	9	5⅛— 5¾
49,560	10	2¾%	Do. 5% Trust Mort. Deb.	100	106⅜—107½
£125,240	Stk	5%	Stephenson (Robert) & Co., Ltd., Or.	10	1⅜— 2⅝
25,000	10	—	Do. 5½% Cum. Pref.	10	4 — 4½
25,000	10	5/6	Do. 4% Perp. Deb. Stock	100	77— 80
£250,000	Stk	4%	Stewarts & Lloyds, Ltd., Ord.	10	17⅜—18½
85,000	10	9/-	Do. 6% Cum. Pref.	10	14⅜— 15
55,000	10	6/-	Swan, Hunter & Wigham-Richardson, Lim. Ord.	1	⅜— ⅞
684,732	1	6d.	Do. 5% Cum. Pref.	1	⅝— 1
538,845	1	6d.	Do. 4½% 1st Mort. Deb Stk. Red	100	98 — 101
£240,000	Stk	4½%	Thames Iron Works, Shipbuilding & Engineering Co., Ltd., 5% Cum. Pf.	1	⅞— ⅞
300,000	1	6d.	Do. 4% Irredeem. 1st Mort. Deb.	100	76 — 80
£200,000	100	4%	Thornycroft (John I.) & Co., Ltd. Or.	1	⅝— ⅞
£148,500	1	7½d.	Do. do. 6% Cum. Pref.	1	1⅛— 1 1/16
£160,000	1	7½d.	Tylor (J.) & Sons, Ltd. 5% Cum. Pf.	10	1 9/16— 10⅝
10,000	10	5/-	United States Steel Corp. Com. Stk.	$100	28⅝— 28⅞
$508495200	$100	8½	Do. 7% Cum. Pref. Stock	$100	97 —97½
$360314100	$100	8½	Do. 10-60yr. 5% Skg. Fd. G. Bds.	$1000	96— 98
$162268000	$1000	5%	Vickers, Sons & Maxim, Ltd. Ord.	1	2 5/16—2 7/16
3,350,000	1	1/6	Do. 5% Non-Cum. Pref.	1	1⅛ —1⅛
750,000	1	6d.	Do. 5% Non-Cum. Pref. Stock.	100	118 —121
£750,000	Stk	5%	Do. 4% 1st. Mort. Deb. Stk. Red.	100	105 —107
£1,250,000	Stk	4%	Do. 4½% 2nd Mort. Debs., Red.	100	105 —107
£1,000,000	100	4½%	Weardale Steel, Coal & Coke, Ltd., Def. Ord.	1	1⅜— 1⅝
225,000	1	1/2⅔	Do. 6% Cum. Pref. Ord.	1	⅞— 1
500,000	1	7½d.	Do. 4% Perpetual Deb. Stock	100	88 — 87
£300,000	Stk	4%	Weldless Steel Tube, Ltd., Cum. Pref. 5½	5	4¼— 4⅜
7,687	5	2/9	Do. Mort. Deb. 4½%	100	92 — 98
100	Stk	4½%	Willans & Robinson, Ord.	5	1 — 2
66,666	5	3/-	Do. 6% Cum. Pref.	5	2¼— 3½
66,666	5	3/-	Do. 4% 1st Mort. Deb. Stk. Red	100	73 — 78
£246,641	Stk	4%	Yorkshire Iron & Coal Co., Ltd., 4½% 1st Mort. Deb. Stk. Red.	100	76—78
£150,000	Stk	4½%			

Stocks and Shares marked * are quoted ex-dividend.

II.—ELECTRICAL MANUFACTURING COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
70,000	1	6d.	Alliance Elec. Co., Ltd. 5% Cum. Pf.	1	⅜ — ⅞
125,000	1	7½d.	Aron Elec. Meter Ltd., 6% Cum. Pf.	1	⅞ — 1
120,000	1	1/2½	Bell's Asbestos Co., Ltd.	1	1 5/16 — 1 7/16
100,000	5	4/-	British Insulated & Helsby Cables Ltd., Ord. ..	5	5½ — 6
100,000	5	3/-	Do. 6% Cum. Pref.	5	5½ — 6
£500,000	Stk	4½%	Do. 4½% 1st Mort. Deb. Stk. Red.	100	103 — 106
£200,000	Stk	4½%	British Thomson-Houston Co., Ltd., 4½% 1st Mort. Deb. Stk. Red. ..	100	100 — 102
400,000	5	3/-	British Westinghouse Electric and Manufac. Co., Ltd., 7% Pref. ..	5	2½ — 2⅝
£616,358	Stk	4%	Do. 4% Mort. Deb Stk. Red...	100	89 — 91
105,731	2	2/-	Brush Elec. Enging. Co., Ltd., Ord..	2	¾ — ¾
150,000	2	2/4½	Do. 6% Pref.	2	1 — 1¼
£125,000	Stk	4½%	Do. 4½% Perp. 1st Deb. Stk...	100	92 — 95
£125,000	Stk	4½%	Do. 4½% Perp. 2nd Deb. Stk.	100	79 — 82
35,000	5	7/6	Callender's Cable & Constn. Ltd. Ord.	5	10 — 11
40,000	5	2/6	Do. 5% Cum. Pref.	5	5⅜ — 5⅝*
£200,000	Stk	4½%	Do. 4½% 1st Mort. Deb Stk. Red.	100	106 — 108*
85,000	3	1/6	Crompton & Co., Ltd...	3	1¼ — 2¼
£100,000	—	5%	Do. 5% 1st Mort. Reg. Debs.	100	95 — 100⅝
52,000	5	10/-	Dick, Kerr & Co., Ltd., Ord. ..	5	7½ — 8
61,000	5	3/-	Do. 6% Cum. Pref.	5	5¾ — 6
£800 000	Stk	4½%	Do. 4½% Deb. Stock, Red. ..	100	106 — 108
233,334	1	6d.	Doulton & Co., Ltd., 5% Cum. Pref.	1	1½ — 1⅝
£233,334	Stk	4%	Do. 1st Mort. 4% Irec. Deb. Stk.	100	107 — 110
99,261	5	1/6	Edison and Swan United Electric Light, Ltd., "A" Shares Nos. 1-99,261	3	1½ — 1⅝
17,139	5	2/6	Do. "A" Shares Nos. 01-017,139	3	2 — 2½
£344,023	Stk	4%	Do. 4% Deb. Stock Red. ..	100	84 — 89
£100,000	Stk	5%	Do. 5% Second Deb. Stk. Red.	100	89 — 94
112,100	2	1/7½	Electric Construction Co. Ltd. ..	2	¾ — 1
31,390	2	2/9⅜	Do. 7% Cumulative Pref. ..	2	2¼ — 2½
£200 000	Stk	4%	Do. 4% Perp. 1st Mt. Deb. Stk.	100	95 — 98
10,248	10	7/6	Evered and Co., Ltd.	10	11 — 13
£100,000	Stk	5%	Ferranti, Ltd., 5% 1st Mort. Deb. Stock, Red...	100	90 — 95
25,000	10	5/-	Gen. Elect. Co. (1900), Ltd., 5% Cum. Pref.	10	9⅞ — 10⅛
£200,000	Stk	4%	Do. 4% 1st. Mt. Deb. Stk., Red.	100	97 — 101
35,000	5	16/-	Henley's (W. T.) Telegraph Works Co., Ltd., Ord.	5	11½ — 12½
35,000	5	2/3	Do. 4½% Cum. Pref.	5	5⅛ — 5⅜
£50 000	Stk	4½%	Do. 4½% Mt. Deb. Stk. Red.	100	109 — 111
50,000	10	5/-	India Rubber, Gutta Percha & Telegraph Works Co., Ltd.,	10	15½ — 16¼*
£300,000	100	4%	Do. 1st Mort. Deb. Red. ..	100	100 — 103
7,500	10	—	Parker, Thos., Ltd.	10	6½ — 7
100,000	1	3%	Scott (Ernest) & Mountain, Ld., Ord.	1	16/3 — 16/9
97,350	12	24/-	Telegraph Construction and Maintenance Co., Ltd.	12	32 — 34
£150,000	100	4%	Do. 4% Deb. Bonds	100	103 — 105

III.—ELECTRIC TRACTION.

Present Amount Subscribed	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
120,000	5	5/-	Anglo-Argentine Trams Co., Ld., Or.	5	8⅜ — 8⅝
260,007	5	2/6	Do. .. .. 5% Cum Pf.	5	6 — 6¼
£230,000	Stk	6%	Do. .. Permanent 6% Debenture Stock, 1888 ..	100	140 — 143*
20,000	10	12/-	Barcelona Trams Co., Ltd., Ord. ..	10	12¾ — 13¼
10,000	10	5/-	Do. .. 5% Cum Pf. Shares	10	9⅝ — 10¼
£46,300	100	5%	Do. .. 5% Debs., Red. ..	100	99 — 102
£191,326	Stk	4½%	Do. .. 4½% Red. Deb. Stk.	100	96 — 100
75,606	1	—	Bath Elec. Trams. Ld., Pf. Or. ..	1	⅜ — ⅝
59,394	1	11·1d	Do. .. 5% Cum. Pf. ..	1	1 1/16 — 1 1/8
75,000	5	—	Brisbane Electric Tram Investment Co., Ltd., Ord.	5	1½ — 1⅝
75,000	5	2/6	Do. .. 5% Cum. Pf. ..	5	3¾ — 4¼
£425.000	Stk	4½%	Do. .. 4½% 1st Deb. Stk., Red.	100	94 — 98
£200,000	Stk	6%	Brit. Columbia Elec. Rly. Co., Ltd., Def. Ord. Stock	100	105 — 108
		5%	Pref. Ord. Stock	100	98 — 101
133,301	10	6/-	Brit. Electric Traction, Ltd., Ord.	10	9½ — 9⅝
156,437	10	6/-	Do. 6% Cum. Pref.	10	11½ — 11¾
£1,000,000	Stk	5%	Do. 5% Perp. Deb. Stk. ..	100	122 — 124
£250,000	Stk	4½%	Do. 4% 2nd Deb. Stk. Red..	100	98 — 100
100,000	5	2/6	Buenos Ayres & Belgrano Electric Trams, Ltd., Ord.	5	3⅜ — 3⅝
40,500	5	3/-	Do. .. "A" 6% Cum Pref. ..	5	5⅛ — 5¼
27,000	5	3/-	Do. .. "B" do.	5	5¼ — 5½

ELECTRIC TRACTION.—*Contd.*

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
£200,000	Stk	5%	Buenos Ayres Elec. Trams Co. (1901) Ltd., 5% Db. Stk., Red.	100	99 — 101
£220,000	100	6%	Buenos Ayres Gd. Nat., Ltd., 6% 1st Deb. Bds.	100	101 — 105
102,268	5	5/-	Calcutta Tramways Co., Ltd. ..	5	8 5/16 — 8 7/16
£350,000	Stk	4½%	Do. .. 4½% 1st Deb. Stk., Red.	100	107 — 109
480,000	1	6d.	Cape Electric Tramways, Ltd. ..	1	1¼ — 1½
40,000	5	2/6	City of Birmingham Trams Co., Ltd. 5% Cum. Pref.	5	4⅞ — 5⅛
£300,000	100	4%	Do. .. 4% 1st Mort. Debs. ..	100	99 — 102
£120,000	Stk	5%	Colombo Elec. Tram. & Light. Co., Ltd., 5% 1st Mort. Deb. Stk. Red.	100	101 — 103
60,000	10	6/-	Dublin United Trams. Co. (1896), Ltd., Ord. ..	10	13½ — 14½
59,987	10	6/-	Do. .. 6% Pref...	10	15 — 16
30,000	5	2/6	Isle of Thanet Elec. Trams. and Light. Co., Ltd., 5% Cum. Pref.	5	2⅞ — 3¼
£150,000	Stk	4%	Do. .. 4% Deb. Stock.. ..	100	85 — 90
125.000	10	5/-	London United Trams. (1901), Ltd., 5% Cum. Pref.	10	10 — 10½
£1,031,000	Stk	4%	Do. .. 4% 1st Mort. Deb. Stk. Red.	100	100 — 103
£50,000	Stk	5%	Madras Electric Trams (1904), Ltd., 5% Deb. Stock, Red.	100	101 — 103
314,016	1	—	Metropolitan Elec. Trams, Ltd., Def.	1	⅜ — 7/16
500,000	1	6d.	Do. .. 5% Cum. Pref... ..	1	1 — 1 1/16
£350,000	Stk	4½%	Do. .. 4½% Deb. Stock, Red.	100	106 — 108
50,000	5	6/-	New General Traction Co., Ltd., 6% Cum. Pref.	5	½ — 1½
110,923	8	3/2⅞	North Metropolitan Tramways Co..	8	4½ — 5
£150,000	100	3½%	Do. .. 3½% Mort. Debs.	100	90 — 95
£198,200	Stk	5%	Perth Electric Trams, Ltd. (W.A.) 5% 1st Mort. Deb. Stock, Red..	100	105 — 108
24,500	10	10/-	Potteries Elec. Traction Co., Ld., Or.	10	8¾ — 9¼
24,500	10	5/-	Do. .. 5% Cum. Pref. ..	10	9¼ — 9¾
£220 000	Stk	4½%	Do. .. 4½% Deb. Stk., Red.	100	101 — 104

IV.—ELECTRIC LIGHTING AND POWER.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
7,500	10	14/-	Bournemouth & Poole Elec. Sup. Co., Ltd.. Ord. ..	10	11½ — 12½
7,500	10	4/6	Do. .. 4½% Cum. Pref. ..	10	10 — 10¾
7,500	10	6/-	Do. .. 6% Cum. Second Pf. ..	10	11¼ — 12¼
£70,000	Stk	4½%	Do. .. 4½% Deb. Stock Red ..	100	107 — 109
14,000	5	3/6	Bromley (Kent) Elec. Lt. & Pr. Co. Ld	5	5¼ — 5⅝
£50,000	Stk	4½%	Do. .. do. 4½% 1st Deb. Stk. Red.	100	102 — 105
27,507	5	5/6	Brompton & Kensington Elec. Supply Co., Ltd. Ord. ..	5	9⅜ — 10¼
12,493	5	3/6	Do. .. 7% Cum. Pref. Shares..	5	9¼ — 10⅛
60.000	5	5/-	Calcutta Elec. Sup. Cor. Ltd., Ord..	5	9 — 9½
£288,782	Stk	4%	Central Elec. Sup. Co., Ltd., 4% Gua. Deb. Stk. ..	100	103 — 106
70,000	5	4/-	Charing Cross & Strand Elec. Sup. Corp., Ltd., Ord... ..	5	7½ — 8¼
80,000	5	2/3	Do. .. do. 4½% Cum. Pref...	5	5½ — 5⅝
£350,000	Stk	4%	Do. .. do. 4% Deb. Stk. Red.	100	105 — 107*
41,436	5	3/9	Chelsea Elec. Sply. Co., Ltd., Ord.	5	6⅛ — 6⅜
£150,000	Stk	4½%	Do. .. do. 4½% Deb. Stk., Red	100	109 — 111
70,595	10	7/-	City of London El. Lghtg. Co., Ld., O.	10	10¾ — 11½
40,000	10	6/-	Do. .. 6% Cum. Pref.	10	14 — 14½
£400.000	Stk	5%	Do. .. 5% Deb. Stk., Red ..	100	124 — 128
£300,000	Stk	4½%	Do. .. 4½% 2nd Deb. Stk., Red	100	104 — 106
40,000	10	5/-	County of London Elec. Supply Co., Ltd., Ord.	10	8½ — 9
30,000	10	6/-	Do. .. 6% Cum. Pref.	10	12⅜ — 12⅝
£400,000	Stk	4½%	Do. .. 4½% Deb. Stk., Red. ..	100	113 — 116
70,000	5	2/6	Edmundson's Elec. Cor. Ltd., Ord.	5	5⅜ — 6¼
70,000	5	3/-	Do. .. 6% Cum. Pref.	5	6 — 6¼
£300,000	Stk	4½%	Do. .. 4½% 1st Mort. Db. Stk. Reg	100	107 — 109
£80,000	Stk	5%	Electric Lighting & Traction Co. of Australia, Ltd. 5% Deb. Stk. Red.	100	86 — 91
10,000	5	/6	Folkestone Elec. Supply Co., Ld., O.	5	5¼ — 5⅜
£50.000	Stk.	4½%	Do. .. 4½% 1st Deb. Stk., Red.	100	101 — 104
15,000	10	—	Havana Electricity Co., Ltd... ..	10	9½ — 10½
13,000	5	5/-	Hove Elec. Lighting Co., Ltd., Ord.	5	7¾ — 8¼
£50,000	Stk	4½%	Isle of Wight Electric Light & Power Co., Ltd. 4½% Deb. Stock, Red.	100	100 — 103
150,000	1	—	Kalgoorlie Electric Power & Lighting Corp, Ltd., 6% Cum. Pref.	1	⅜ — ⅝
21,000	5	7/-	Kensington and Knightsbridge Electric Lighting Co., Ltd., Ord. ..	5	11½ — 12½

Stocks and Shares marked * are quoted ex-dividend.

ELECTRIC LIGHTING AND POWER.—*Contd.*

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
£135,000	Stk	4%	Kensington and Knightsbridge Electric Lighting Co., Ltd., and the Notting Hill Electric Lighting Co., Ltd., 4% Deb. Stock, Red.	100	101 —103
111,000	3	1/9⅔	London Elec. Supply Corp., Ld., Ord.	3	2 — 2⅛
60,000	5	3/-	Do. 6% Pref.	5	5 — 5⅛
£371,895	Stk	4%	Do. 4% 1st Mort. Db. Stk., Red.	100	97 — 99*
100,000	10	11/-	Metropolitan Elec. Sup. Co., Ld., Or.	10	9⅜—10⅛
76,121	5	2/3	Do. 4½% Cum. Pref.	5	5⅛ — 5⅜
220,000	Stk	4½%	Do. 4½% 1st Mort. Db. Stk., Red.	100	111 —115
250,000	Stk	3½%	Do. 3½% Mort. Deb. Stk., Red.	100	98 —100
£250,000	—	4½%	Midland Elec. Corp. for Power Distribution Ld., 4½% 1st Mort. Deb.	100	100—102⅝
10,852	10	8/-	Notting Hill Elec. Ltg. Co. Ltd. Ord.	10	14½—15½
£59,000	100	4%	Do. 4% 1st Mort. Debs. ..	100	100 —102
16,500	5	4/6	Oxford Electric Co. Ltd., Ord. ..	5	6½ — 7
£50,000	Stk	4%	Do. 4% Debenture Stk. Red.	100	99½—101½
£84,700	100	4½%	Royal Elec. Co. (of Montreal) 4½% 20-yr. 1st Mort. Deb	100	101 —104
40,000	5	9/6	St. James' & Pall Mall Elec. Light Co., Ltd. Ord.	5	13⅜—14⅜
20,000	5	3/6	Do. 7% Pref...	5	8½ — 9
£150,000	Stk	3½%	Do. 3½% Deben. Stock, Red	100	98 —100
12,000	5	4/-	Smithfield Markets Elec. Supply Co., Ltd. Ord.	5	2⅝— 8⅛
£50,000	Stk	4%	Do. 4% Debenture Stk. Red.	100	79 — 83
65,000	5	4/-	South London Elec. Sup. Co., Ltd, O.	5	3⅜— 4½
100,000	1	—	South Metropolitan Elec Light & Power Co., Ltd. Ord.	1	3/32— 7/32
50,000	1	8⅝d.	Do. 7% Cum. Pref.	1	1 3/32—1 11/32
£100,000	Stk	4½%	Do. 4½% 1st Deb. Stock. Red.	100	105 —108
50,000	5	2/6	Urban Electric Supply Co., Ltd., O.	5	4¾ — 5
30,000	5	2/6	Do. 5% Cum Pref.	5*	5⅜— 5⅝
£200,000	Stk	4½%	Do. 4½% 1st Mort. Deb. Stk. Red	100	104—106
110,000	5	7/6	Westminster Elec. Supply Corp. Ltd., Ord.	5	12 —13
28,151	5	2/6	Do. 5% Cum. Pref.	5	6½ — 6⅞

V.—TELEGRAPH & TELEPHONE COMPANIES.

Present Amount Subscribed	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
£34,800	100	4%	African Direct Tel. Co., Ld., 4% Mt. Debs. (Series A), Red.	100	100—103
25,000	10	—	Amazon Telegraph Co., Ld... ..	10	2¼ — 2⅜
£763,580	Stk	15/-	Anglo-American Tel. Co., Ltd., Ord.	100	59 — 61
£3,118,210	Stk	30/-	Do. 6% Preferred Ordinary	100	105½—106½
£3,118,210	Stk	2/-	Do. Deferred Ordinary ..	100	15 —15½
44,000	5	3/-	Chili Telephone Co., Ltd.	5	6⅜— 6⅝
$ 15,000,000	$100	$2	Commercial Cable Co., Capital Stk.	$100	———
£1,903,856	Stk	4%	Do. Sterl. 500-yr 4% Deb. Stk., Red.	100	97½— 99½
16,000	10	5/-	Cuba Submarine Tel. Co., Ld., Ord.	10	8 — 8½
6,000	10	10/-	Do. 10% Preference	10	16 — 17
6,000	5	2/-	Direct Spanish Telegraph Co., Ord.	5	3⅜— 3⅝
		5/-	10% Cum. Preference	5	8⅞— 9⅛
£30,000	50	4½%	Do. 4½% Debs...	50	102-104⅝
60,710	20	3/-	Direct U.S. Cable Co., Ltd... ..	20	11⅛—11⅜
£85,800	100	4½%	Direct West India Cable Co., Ltd., 4½% Reg. Debs.	100	101—103
£300,000	100	4%	East. & S. African, Ld., 4% Mt. Dbs.	100	100—102
£200,000	25	4%	Do. 4% Rg. Mt. Dbs. (Mauritius Subsidy)..	25	100-102⅝
300,000	10	2/6	Eastern Extension, Australasia and China, Ltd...	10	14 — 14⅛
£602,400	Stk	4%	Do. 4% Mort. Deb. Stk., Perp.	100	105 —107
£1,000,000	Stk	25/-	Eastern Tele. Co., Ltd., Ord. ..	100	141 —144
£2,000,000	Stk	17/6	Do. 8 % Pref.	100	90 — 92
£1,836,814	Stk	4%	Do. 4% Mort. Deb.	100	107 —109
150,000	10	5/-	Great Northern Telegraph Co., Ltd., (of Copenhagen) ..	10	33½ — 34½
£58.700	100	4½%	Halifax and Bermudas Cable Co., Ltd., 4½% 1st. Mort. Debs. Red.	100	101—103
17,000	25	12/6	Indo-European Tele. Co., Ltd. ..	25	49 — 51
72,680	1	7½d.	Monte Video Telephone Co., Ltd., O.	1	3/8 — 7/16
£1,983,333	Stk	6%	National Telephone Co., Ltd., Pref.	100	111½—112½
£1,966 667	Stk	5%	Do. Deferred	100	102—104
250,000	5	2/6	Do. 5% Non-Cum. 3rd Pref.	5	5⅛ — 5⅜
£2,000,000	Stk	3½%	Do. 3½% Deb. Stk., Red. ..	100	100—102
£649,593	Stk	4%	Do. 4% do. do. ..	100	103—105
179,313	1	8⅜d.	Oriental Telephone & Elec. Co., Ltd.	1	1⅛ — 1⅛
50,000	1	7½d.	Do. 6% Cum. Pref.	1	1 1/16—1 1/16
£100,000	100	4%	Pacific & European Tel. 4% Guar. Debs. Red...	100	99 —102
11,839	8	4/-	Reuter's Telegram Co., Ltd. ..	8	7½— 8
58,000	5	3/-	United River Plate Telep. Co., Ltd.	5	6½— 7½
40,000	5	2/6	Do. 5% Cum. Pref.	5	5 — 5⅛
£179,947	Stk	5%	Do. 5% Deb. Stock, Red. ..	100	108—110
15,609	10	5/-	W. African Telegraph Co., Ltd. ..	10	8 — 8⅛*
£30,008	2½	—	West Coast of America, Ltd. ..	2½	7/16— 9/16
150,000	100	4%	Do. 4% Deb. Guar. by West. Tel.	100	100 —102

TELEGRAPHS AND TELEPHONES.—*Contd.*

Present Amount Subscribed.	Shares.	Last Dividend.	Name	Paid up.	Closing Prices.
88,321	10	6d.	W. India & Panama Teleg. Co., Ld., Or.	10	⅛ — ⅜
34,563	10	6/-	Do 6% Cum. 1st. Pref. ..	10	7⅛— 8
4,669	10	6/-	Do. 6% Cum. 2nd Pref. .	10	5⅛— 5⅜
£80,000	100	5%	Do. 5% Deb.	100	104 —106
207,980	10	8/-	Western Telegraph Co., Ltd. ..	10	13⅜ — 14⅛
£75,000	100	5%	Do. 5% Debs., 2nd Series, 1906	100	101 —103
518,945	Stk	4%	Do. 4% Deb. Stock, Red. ..	100	103 —105

VI.—SHIPPING COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices
32,500	10	5/6	Anchor Line (Henderson Bros.), Ltd., 5% Cum. Pref.	10	8⅜— 9
£325,000	Stk	4½%	Do. 4½% Red. 1st Mort. Deb. Stk.	100	99—101
£672,900	Stk	4½%	British & African Stm. Nav. (1900), Ltd., 4½% 1st Mort. Deb. Stk. Red.	100	97 — 99
40,000	10	5/6	Bucknall Steamship Lines, Ltd., 5½% Cum. Pref.	10	5⅜— 6¼
£600,000	Stk	4½%	Do. 4½% 1st Mort. Deb. Stk.	100	87 — 91
£750,000	Stk	4½%	Clan Line Steamers, Ltd., 4½% Deb. Stk. Red. ..	100	101 —103
60,000	20	16/-	Cunard Steam Ship Co., Ltd., Nos. 1-60,000..	20	12 — 12½
40,000	20	8/-	Do. Nos. 60,001-100,000	10	4⅜— 5⅛
£464,480	Stk	4½%	Elder Dempster Shipping, Ltd., 4½% 1st Mort. Deb. Stk. ..	100	100—102
1,200,000	1	6d.	Furness, Withy & Co., Ltd., Ord...	1	1 3/16—1 5/16
25,328	7½	4/7	Gen. Steam Navigation Co., Ld., Ord.	7½	5 — 5⅜
36,758	8	4/9⅔	Do. Non-Cum. 6% Pref.	8	8 — 8⅛
£150,000	Stk	4%	Do. 4% 1st Mort. Deb. Stk. Red.	100	100—102
55,000	5	1/3	Houlder Line, Ltd., Ord.	5	2⅛— 2⅜
40,000	5	2/9	Do. 5½% Cum. Pref.	5	3 — 3⅛
£200,000	Stk	4½%	Do. 4½% 1st Mt. Deb. Stk. Red.	100	88 — 90
141,500	10	5/-	Leyland (Fredk.), & Co.. (1900), Ltd., 5% Cum. Pref. ..	10	4 — 4½
£1,160,000	Stk	5 %	Peninsular and Oriental Steam Nav. Co., 5% Cum. Pref. ..	100	129 —132
£1,160,000	Stk	19%	Do. do. Deferred ..	100	223 —226
15,000	100	30/-	Royal Mail Steam Packet Co. Ord...	60	30 — 31
39,075	5	2/6	Shaw, Savill & Albion, Ltd., 5% Cum. "A" Pref..	5	4⅜— 5⅛
39,075	5	2/6	Do. "B" Ord...	5	4 — 4⅛
141,841	10	4/-	Union Castle Mail Steamship Co., Ltd., Ord..	10	8 — 8⅛
24,000	10	4/6	Do. 4½% Cum. Pref... .	10	10½— 10⅝
£1,008,894	Stk	4%	Do. 4% Debenture Stk., Red.	100	103 —105

VII.—MISCELLANEOUS COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices.
60,000	1	9⅜d.	Chadburn's (Ship) Tele. Ltd., Ord...	1	1 1/16—1 3/16
£750,000	Stk	9%	General Hydraulic Power Co., Ltd.	100	127 —132
12,500	10	10/-	Oakey (John) and Sons, Ltd., Ord..	10	24 — 25
10,000	10	6/-	Do. do. 6% Cum. Pf.	10	14 — 15
183,588	1	6·3d.	Power Gas Corp., Ltd., Ord., Nos. 66,463-250	15/-	⅛ — ⅜
66,462	1	8·4d.	Do. do. Nos. 1 66,462	1	3/8 — ½
135,000	1	6d.	Waygood (R.) & Co., Ltd., Ord. ..	1	1⅛ — 1⅛
135,000	1	7½d.	Do. 6% Cum. Pref. ...	1	1⅛ — 1⅛

RAILWAY CARRIAGE & WAGON COMPANIES.

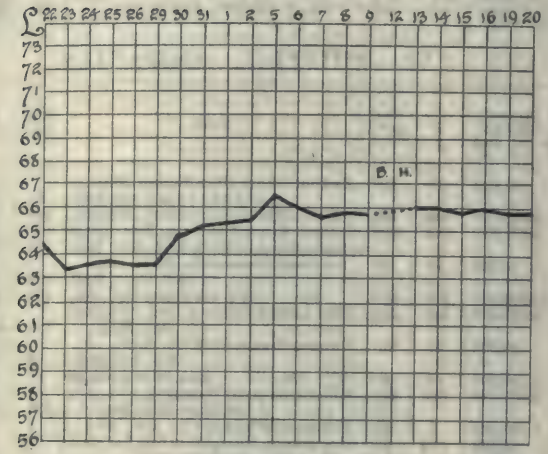
Present Amount Subscribed.	Shares.	Last Dividend.	Name.	Paid up.	Closing Prices
10,000	10	7/6	Birm. Railway-Car. & Wagon, L., 1-10,000	10	22½—23
8,739	10	3/-	Do. Second Issue 1-8,739....	4	8¼— 9¼
10,000	10	6/-	Do. Cum. Pref. 6% 1-10,000..	10	13 —13½
30,111	7	7/-	Gloucester Rail.-Car & Wagon, Ld., A, 1-29,861 & 49,751-50,000	7	9⅛— 9⅝
44,889	7	3/6	Do. B, 29,862-49,750, 50,001-75,000	7	4⅛— 4⅜
14,567	10	1/3	Lancashire Wagon, Ord.	2	2⅜ — 2½
4,150	10	5%	Do. do.	10	10⅛— 10⅜
784,808	1	9d.	Metropolitan Amalgamated Rail.-Carriage & Wagon, Ld., 1-784,808	1	41/9-42 6*
164,288	1	6d.	Do. Cum. A Pref. 5% 1-164,288	1	23/6 -24/6*
235,000	1	7½d.	Do. Cum. B Pref. 6% 1-235,000	1	27/ -27/6
20,000	20	20/-	Midland Rail.-Car. & Wagon, Ld., 1-20,000	10	19 —19½

Stocks and Shares marked * are quoted ex-dividend.

THE HOME METAL MARKET

SHOWING DAILY FLUCTUATIONS FROM MAY 22ND TO JUNE 20TH, 1905.

COPPER.



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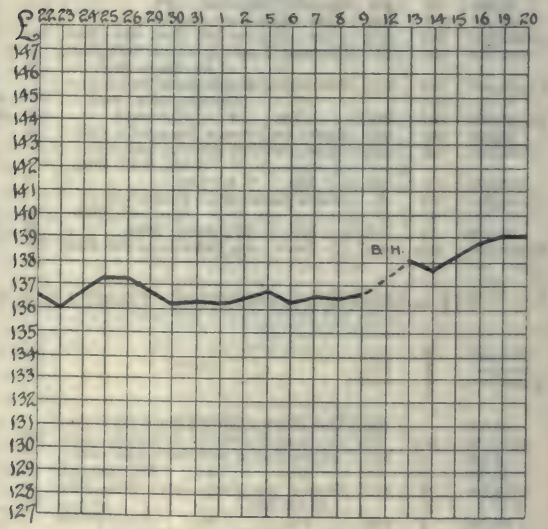
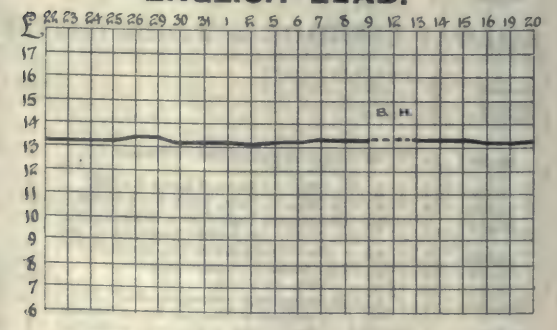
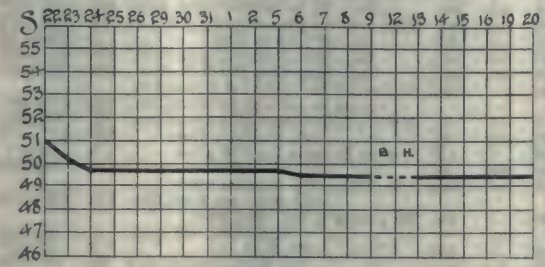


ENGLISH LEAD.



PIG IRON: SCOTCH,



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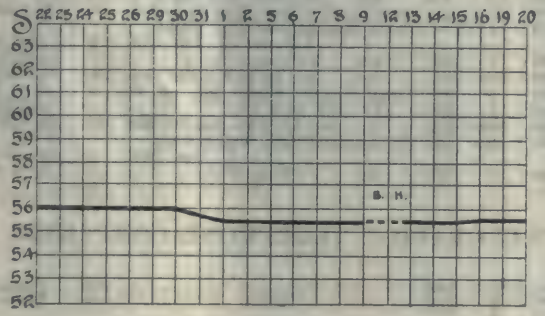
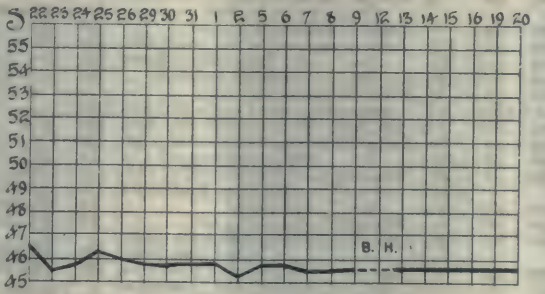
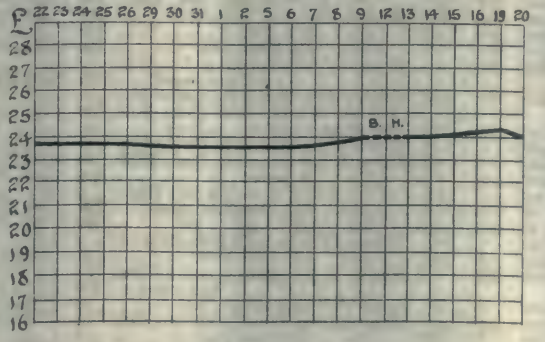


CLEVELAND.



SPELTER.



PRICES CURRENT OF COAL, IRON, STEEL, AND OTHER METALS.

MANUFACTURERS' AND MERCHANTS' QUOTATIONS.

MARKET REPORT.

Wednesday, June 21st, 1905.

THE Copper market has been exceedingly quiet since the holidays. The American position is not without significance, and attention may be directed to the statement in the Amalgamated Company's report that that company controls only 25 per cent. of the American production. It is consequently clear, as Mr. Walter Barnard has pointed out that outside the Amalgamated Company there are such important interests that the market is less than ever at the mercy of the Amalgamated group, and the situation forces the conclusion that while this combine has been holding for top prices its competitors have probably been keeping values down. The closing price for all positions is £66 5s.

In the Tin market, although prices show an advance on balance due to the fact that supplies are limited and under strong control, speculative interest remains somewhat restricted. The demand from consumers has been tolerably good, but has shown signs of easing during the past few days, and there was a slight setback in cash prices yesterday, but some support was in evidence for forward metal. The shipments for the East for the present month are now expected to be lower than the original estimate, and quotations ought to go higher. To-day's closing prices were £139 2s. 6d. to £139 12s. 6d. fine foreign cash, and £138 three months.

Lead remains firm on a continuance of the good demand from consumers and a fresh advance in quotations is to be recorded at soft foreign spot, £13 1s. 3d.; English, £13 5s. to £13 6s. 3d.

Spelter, after a rise in the early part of the week, is somewhat easier, but business remains very active and good quantities are now being absorbed by the yellow metal makers, while the published figures show very large exports for last month. Ordinaries are quoted at £24, and Specials at £24 5s. to £24 7s. 6d.

The Iron and Steel market remains in a neglected condition, but the changes in quotations are without importance, Cleveland being dealt in at 45s. 6d. and standard at 44s. 3d. Messrs. Merton and Co.'s circular states that the situation in America has not improved, and while prices for pig iron are still maintained owing to the decision of makers not to press their products upon an unwilling market, the tendency of quotations is towards a lower level.

IRON, STEEL, PIG-IRON, &c.

SCOTLAND.

Messrs. David Colville and Sons, Ltd., Dalzell Steel and Iron Works, Motherwell, N.B., quote as follows. Prices delivered in Glasgow or equal:—

Steel:		£	s.	d.
DALZELL	Siemens' Steel Plates, Marine Boiler Quality ..	6	15	0
STEEL	,, ,, ,, Land ,, ,, ...	6	17	6
	,, Steel Bars, Boiler Quality	6	17	6
DALZELL	Siemens' Steel Plates, Ship Quality Plates.....	5	17	6
STEEL	,, ,, Bars ,, ,, ...	6	7	6
	,, ,, Angles.....	5	7	6

Manufactured Iron:

Bars—Dalzell.....		6	2	6
,,	Best	6	12	6
,,	,, Horseshoe	6	12	6
,,	Angle.....	6	2	6
,,	Best Angle	6	12	6
,,	Best Best	7	2	6
,,	Extra Best	7	12	6

Usual terms and extras. Special rates for delivery in England and export. The above prices subject to alteration without notice

The Glasgow Iron and Steel Co., Ltd., Wishaw, quote as under (prices are delivered Glasgow or equal):—

	£	s.	d.	
Steel Angles (Glasgow Steel)	5	7	6	per ton.
Steel Ship Plates (Glasgow Steel)	5	17	6	,,
Steel Bars, Ship Quality (Glasgow Steel)	6	7	6	,,
Steel Bars, Boiler Quality (Glasgow Steel)	6	17	6	,,
Steel Land Boiler Plates (Glasgow Steel)	6	7	6	,,
Steel Marine Boiler Plates (Glasgow Steel)	6	7	6	,,

Less 5 per cent. discount. Extras as per standard list.

Special prices for delivery in England and for export. The above prices subject to alteration without notice.

John Spencer (Coatbridge), Ltd., Phœnix Ironworks, Coatbridge, N.B., quote:—

		£	s.	d.
Bars—Phœnix		6	5	0
,,	Best	6	15	0
,,	Best Best	7	5	0
,,	Extra Best.....	7	15	0
,,	Best Horse Shoe	6	15	0
,,	Extra B.H.S.	7	15	0
,,	Extra Best Cable	8	5	0
,,	Rivet	6	5	0
,,	Best Scrap Rivet	7	5	0

	£ s. d.
Angles—Phœnix	6 5 0
,, Best	6 15 0
,, Extra Best	7 5 0
Gas Tube Hoops—Phœnix Best	6 15 0
Plates—Phœnix	—
,, Best Boiler	7 10 0
,, Best Best Boiler	8 0 0
,, Extra Best Boiler	9 0 0
Boiler Tube Strips—Phœnix Best Best	8 0 0

All per ton, delivered f.a.s., Glasgow, Greenock, Grangemouth, Granton, Leith, or Ardrossan. 5 per cent. discount cash monthly.

Messrs. R. Feldtmann and Co., of Glasgow, quote Commission extra).

Pig Iron:	No. 1. £ s. d.	No. 3. £ s. d.
Coltness, f.a.s. Glasgow	3 3 0	2 13 0
Gartsherrie ,,	2 17 0	2 13 0
Summerlee ,,	2 17 6	2 13 6
Carnbroe ,,	2 14 6	2 13 0
Langloan ,,	3 0 0	2 15 0
Calder ,,	2 18 0	—
Clyde ,,	2 16 6	2 12 6
Glengarnock, f.o.b. Ardrossan	2 17 0	2 12 6
Eglinton ,, ,,	2 12 6	2 10 6
Dalmellington, ,, Ayr	—	2 12 0
Shotts ,, Leith	2 17 6	2 12 0

NORTH OF ENGLAND.

Messrs. W. Whitwell and Co., Ltd., Thornaby Ironworks, Stockton, quote as follows, **at works:—**

	£ s. d.
W.W. ♔ Bars	6 12 6
W.W. Best Bars	7 2 6
W.W. Best Best	7 12 6
W.W. Best Best Best	8 2 6
W.W. Best Shoe	7 2 6
Thornaby ♔	8 2 6
Thornaby Best	8 12 6
Thornaby Best Best	9 12 6
Whitwell Special Admiralty Cable	10 5 0
Special Chain Iron	9 5 0
Tube and Nail Strips	6 15 0
W.W. ♔ Angle Iron	6 15 0
W.W. Best Angle Iron	7 5 0
Tee Iron, to 8-inches United	7 12 6

Terms, Cash, less 2½ per cent. discount on 10th of month following delivery.

LANCASHIRE.

The Pearson and Knowles Coal and Iron Company, Ltd. Dallam and Bewsey Forges, Warrington, quote:—

		Iron. £ s. d.	Steel. £ s. d.
♔ (BN)	Bars	6 10 0	6 15 0
	Angles	7 0 0	7 5 0
	Tees	7 10 0	7 15 0
♔ W.I.W	Hoops	7 0 0	7 10 0
	Sheets	7 10 0	8 0 0

Ordinary Sizes, F.A.S. Liverpool in 10-ton Lots.

Extras for Sizes and Cutting as per List.

WORCESTERSHIRE.

Baldwins Ltd. (with which is amalgamated Knight and Crowther, Ltd.), Wilden Works, near Stourport, quote:—

Black Sheets:	Singles 20 G 96in. by 36in. per ton. £ s. d.	Doubles 21 G to 24 G 96in. by 36in. per ton. £ s. d.
"Vale"	10 0 0	10 10 0
"Shield"	10 10 0	11 10 0
"Severn"	11 10 0	12 10 0
"Baldwin Wilden B."	12 10 0	13 10 0
Charcoal	16 10 0	17 10 0
Best Charcoal	18 10 0	19 10 0

Pickled, cold-rolled and close annealed sheets specially quoted for.

Extra widths, Singles to 66in., Doubles to 56in., Lattens to 46in. Extra lengths, Singles to 168in., Doubles to 132in., Lattens to 108in.

Patent Coated Sheets:

	£ s. d.	£ s. d.
No. 3 Lead	13 10 0	14 10 0
S.V. Lead	15 0 0	16 0 0
No. 3 Terne	15 0 0	16 0 0
S.V. Terne	16 10 0	17 10 0

Tinned Sheets:	Singles 20 G to 108 by 36in. per ton. £ s. d.	Doubles 21 to 24 G to 96 by 36in. per ton. £ s. d.
Best Coke (Finish)	29 0 0	30 10 0
,, Charcoal (Finish)	31 0 0	32 10 0
Extra ,, ,,	33 0 0	34 10 0

Cotton Can Tin Sheets to 39in. by 36in. specially quoted for.

Tin Plates, "Cookley, K" Best Charcoal, £1 7s. 0d. per box.

Extreme sizes in Tin and Patent Coated specially quoted for.

Lattens up to 36 wide by 27 W.G. £1 10s. 0d. per ton extra throughout for all brands.

At works.

Galvanized Corrugated Sheets:

	£ s. d.	
"Phœnix" Brand, 24 G., f.o.b. London, in Bundles	11 15 0	per ton.
"Blackwall" Brand, 26 G., in felt-lined cases for Australia, f.o.b. London	14 5 0	,,

Galvanized Working Up-Sheets:

	£ s. d.	
24 G., f.o.b. London, in Bundles	13 0 0	per ton.

STAFFORDSHIRE.

Shelton Iron, Steel, and Coal Co., Ltd., Stoke-on-Trent, North Staffordshire, and 122, Cannon Street, London, quote:—

	£ s. d.	
Crown Bars	6 10 0	per ton.
Best Bars (1 to 6in. wide, above ¼ in. thick, ½ in. to 4 rounds and squares)	7 0 0	,,
Angles	6 15 0	,,
,, Best	7 5 0	,,
T's	7 0 0	,,
,, Best	7 10 0	,,
Best Shoe Iron	8 0 0	,,
,, Rivet Iron	8 0 0	,,
,, Best Rivet (Special)	9 5 0	,,
,, Cable	9 5 0	,,
,, Screwing	8 5 0	,,

	£	s.	d.	
Best Turning	8	0	0	per ton.
,, Plating	8	5	0	,,
Best Best	9	5	0	,,
Treble Best	10	5	0	,,
Plates	7	10	0	,,
Best Plates	8	0	0	,,
,, Boiler Plates	8	10	0	,,
,, Best Boiler Plates	9	10	0	,,
Treble Best Boiler Plates	12	0	0	,,

Delivery f.o.b. Liverpool, Birkenhead or Manchester.

WALES.

Cordes (Dos Works), Ltd., of Newport, Mon., quote "Star" brand patent wrought nails steel nails, &c.

Discounts—

45 per cent. off 1-inch to 3-inch strong rose and all fine rose and 6dy. and 8dy. pound.

40 per cent. off 3½-inch to 7-inch strong rose and 10dy. and 20dy. pound.

40 per cent. off all sharp-pointed nails.

Delivered in lots of 4 cwt. and upwards. Extra 2½ per cent. discount off the gross on two tons and upwards.

Steel rose, flat points, 5-inch to 7-inch basis:—

2 tons 9/6 per cwt.
4 cwt. lots and upwards 9/9 per cwt. } d/d any Railway Station.

Steel cut nails, 3-inch basis—

2 tons 8/3 per cwt.
4 cwt. lots 8/6 per cwt. } d/d any Railway Station.

Slit rods (iron) £7 10s. per ton, at works for 2-ton lots.

Messrs. Richard Thomas and Co., Ltd., of 33 and 35, Eastcheap, E. C. — Works: South Wales, Burry, Lydney, Lydbrook, and Cwmbwrla, quote:—

	Per Box. f.o.b. Wales. £	s.	d.
Coke Tin-plates.			
C 18¾ by 14 124s. 110 lb. "BV"	0	12	0
C 20 by 10 225s. 155 ,, "Jumbo"	0	17	0
C 20 by 14 112s. 108 ,, "Lydbrook"	0	11	9
C 28 by 20 112s. 216 ,, "Lydbrook"	1	3	9
Charcoal Tinplates:			
C 20 by 14 112s. 108 lb. "Allaway"	0	12	6

BELGIUM.

C. L. Faulkner, Suffolk House, Laurence Pountney Hill, London, E.C., quotes:—

Prices quoted are in £ stg. and per ton of 1,015 kos. (2,240 lb.) delivered free on board ANTWERP for approved quantities.

	£	s.	d	
Steel:				
Blooms	at 3	16	0	per ton.
Billets	at 3	18	0	,,
Sheet Bars	at 4	0	0	,,
Finished Steel:				
Bars	at 5	2	0	per ton.
Angles	at 5	3	0	,,
Tees	at 5	6	0	,,
Joists	at 4	10	0	,,
Fencing Standards	at 5	3	6	,,
Shoeing Bars	at 5	5	0	,,
Tyre Bars	at 5	5	0	,,
Half-Round Bars	at 5	10	0	,,
Heavy Rails	at 5	5	0	,,
Light Rails	at 4	17	6	,,

Structural Steelwork:

Prices on application.

METALS.

Messrs. French and Smith, 147, Leadenhall Street, and 11, Oldhall Street, Liverpool, quote:—

TIN.

Tin:	£	s.	d.		£	s.	
English Ingots, f.o.b. Dis. 1¼% & 1%	139	0	0	to	139	10	0 per ton.
English Bars, f.o.b. Dis. 1¼% & 1%	134	0	0	to	140	10	0 ,,
Straits G.M.B., cash Warehouse, Net	138	15	0	to	139	0	0 ,,
Straits G.M.B., 3 months, Warehouse, Net	137	0	0	to	136	5	0 ,,
Australian, Mt. Bischoff, Warehouse, Net	141	0	0	to	142	0	0 ,,

COPPER

Copper:	£	s.	d.		£	s.	d.	
Standard G.M.B., cash Warehouse, Net	65	15	0	to	66	0	0	per ton.
Standard G.M.B., 3 months, Warehouse, Net	65	15	0	to	66	0	0	,,
English, Tough, Cake & Ingot, Warehouses, Net	69	15	0	to	70	0	0	,,
English, Best Select, Warehouse Net	70	1	0	to	71	0	0	,,
English, Sheets and Sheathing, f.o.b., Dis. 2½%	79	0	0	to	80	0	0	,,
English, Sheets for India, f.o.b., Dis. 2½%	75	0	0	to	76	0	0	,,
Electro, Warehouse, Net	69	5	0	to	69	10	0	,,
Ore, ex. ship	0	11	9	to	0	12	9	per unit.
Regulus, Matte and Precipitate, ex ship,	0	13	0	to	0	13	6	,,

YELLOW METAL.

Yellow Metal:	£	s.	d.	
Sheets, 4 by 4 feet for India f.o.b. Dis. 2½%	0	0	6⅝	per lb.
Sheathing ,, ,,	0	0	6½	,,

SPELTER.

	£	s.	d.		£	s.	d.	
Silesian outports, Net	24	5	0	to	24	7	6	per ton.
Blende of 50 % Net	6	12	6	to	6	13	6	,,
Calamine, Net	6	15	0	to	6	16	0	,,

LEAD.

	£	s.	d.		£	s.	d.	
English Pig, Warehouse, Dis. 2½%	13	5	0	to	13	7	6	per ton.
Spanish, ex ship, Dis. 2½%	13	0	0	to	13	1	3	,,
Lead Ore of 70 %, Net	6	14	6			—		

ANTIMONY.

	£	s.	d.		£	s.	d.	
Star Regulus, f.o.b., Dis. 2½ %	46	0	0	to	47	0	0	per ton.
Ore, 50 %, ex ship, Dis. 2½%	16	0	0	to	16	10	0	,,
Crude, ex ship, Dis. 2½ %	29	0	0	to	30	0	0	,,

QUICKSILVER.

	£	s.	d.	
Spanish, 75 lb., Warehouse, Net	7	7	6	per flas
Italian ,, ,, ,,	7	5	6	,,

COAL.

LEICESTERSHIRE.

The Nailstone Colliery Company, Leicester, quote. Price per Ton at Pit of 20 Cwt., with ½ Cwt. per Ton for wastage —

Upper Main Seam.	s.	d.
Main Coal	6	0
Best Hard Steam (hand picked, as used by the Railway Companies)	5	6
Best Hard Steam Cobbles (made through 6 in. mesh, free from slack)	5	6
Fine Slack	0	6

Terms, net cash on 10th of month following delivery.

DERBYSHIRE.

The Manners Colliery Co., Ltd., of Ilkeston quote as follows, per ton at pit:

Kilburn Coal:	s.	d.
Best London Brights	9	9
Large Nuts (1½ to 3½)	9	6
Small Nuts (¾ to 1½)	6	0
Rough Brights	6	0
Peas (⅜ to ¾)	5	0
Slack	3	6
Smudge	2	0

Low Main (or Tupton) Coal:		
Low Main Brights	7	6
,, ,, Nuts	7	3
Hards (Good Steam Coal)	8	0
Bakers' Nuts (1" to 2")	6	6
Slack	3	6

The Clay Cross Company's Collieries, Clay Cross, near Chesterfield, quote:—

	per ton at pit. s.	d.
Best Main Coal	10	6
Best Silkstone	10	0
Best House Coal	8	6
Best House Nuts	8	0
Treble Screened Cobbles	7	9
Best Cobbles	7	3

NOTTINGHAMSHIRE.

The Digby Colliery Co., Ltd., near Nottingham, quote per ton at pit:—

Digby Coal:		
Steam.	s.	d.
Best Hand Picked Hard	8	6
Steam Hard	7	3
Hard Nuts	6	6

Gedling Colliery.

High Hazel.		
London Brights, 4 to 8 in. cube	9	6
Bright Cobbles (Hand Picked)	9	0
Large Nuts, 2 to 4 in. cube	8	0
Small Nuts, 1 to 2 in. cube	6	0
Pea Nuts, ⅜ to 1 in. cube	5	0
Steam.—Top Hard.		
Best Hard	8	6
Hard Steam	7	6
Cobbles	6	3

CHEMICALS.

Messrs. S. W. Royse and Co., Albert Square, Manchester, quote:

	£	s.	d.	
Acids: Oxalic	0	0	2¼	per lb.
Picric, Crystals	0	0	11	,,
Tartaric at Manchester	0	0	10⅞	,,
Acetate of Lime: Brown at Manchester net	9	15	0	per ton.
Grey ,,	12	0	0	,,
Alumina: Alum, Lump, loose	5	5	0	,,
,, ,, in casks	5	7	6	,,
,, Ground, in bags	5	15	0	,,
Sulphate of Alumina, 14%	4	10	0	,,
Ammonia: Carbonate	0	0	3⅝	per lb.
Muriate Grey f.o.b. Liverpool	23	15	0	per ton.
Sal-ammoniac, Lump, 1sts, deld. U.K.	42	0	0	,,
,, ,, 2nds, ,,	40	0	0	,,
Sulphate f.o.b. Liverpool	12	11	3	,,
Arsenic: Best White Powdered net	12	5	0	,,
Bleaching Powder, 35% ,,	4	10	0	,,
Borax: British Refined Crystal ,,	12	0	0	,,

Coal Tar Products:

Benzole, 50/90 % ,,	0	0	6	per gal.
,, 90% ,,	0	0	7	,,
Carbolic Acid Crystals, 34/35° C. ,,	0	0	6½	per lb.
,, ,, ,, 39/40° C. ,,	0	0	6⅝	,,
,, ,, Liquid, 97/99 % ,,	0	0	9	per gal.
,, ,, Crude, 62½% at 60° F. f.o.b. ,,	0	1	9½	,,
Creosote, ordinary good liquid ,,	0	0	1½	,,
Naphtha, Crude, 20 % at 120° C. ,,	0	0	3	,,
,, Solvent, 90% at 160° C. f.o.b ,,	0	0	8	,,
,, ,, 95 % at 160° C. ,, ,,	0	0	9	,,
,, ,, 90 % at 190° C. ,, ,,	0	0	10	,,
,, Rectified, flash point over 73° F. f.o.b. ,,	0	0	11	,,
,, Rectified, flash point over 100° F. f.o.b. ,,	0	1	0	,,
Naphthalene, all qualities. Pitch f.a.s. Manchester. ,,	1	7	6	per ton.
Copperas: Green, in bulk ,,	0	12	6	,,
,, barrels f.o.b. L'pool ,,	1	19	0	,,
Cake ,,	1	2	6	,,
Copper: Sulphate	19	15	0	,,
Cyanides: 98% minimum f.o.b. net	0	0	7½	per lb.
Lead: Acetate (Sugar) White, English	27	10	0	per ton.
,, ,, ,, Foreign c.i.f. U.K	23	5	0	,,
,, ,, Grey	21	15	0	,,
,, ,, Brown at Manchester	16	15	0	,,
Nitrate	24	10	0	,,
Litharge, Flake	15	10	0	,,
,, Powder	16	0	0	,,
Red Lead, Genuine, c.i.f. London less 5%	15	10	0	,,
White ,, ,, Dry ,, ,, ,,	16	15	0	,,
Naphtha (Wood): Miscible, 60 o.p.	0	2	10	per gal.
Solvent	0	2	7	,,
Potash: Bichromate... delivered England	0	0	3	per lb.
Carbonate, 90/92 % ... c.i.f Hull	18	5	0	per ton.
Caustic, 75/80 % ,, ,,	20	10	0	,,
Chlorate net	0	0	3 1/16	per lb.
Montreal in Store, Liverpool	33	10	0	per ton.
Prussiate, Yellow net	0	0	5	per lb.

		£	s.	d.	
Soda:	Ash, Caustic, 48 %, Ordinary ... net	5	5	0	per ton.
	,, ,, ,, Refined..... ,,	6	5	0	,,
	,, Carbonated, 48 %..... ,,	5	10	0	,,
	,, ,, 58 % (Ammonia Alkali) .....net	4	10	0	,,
	,, Bleachers' Refined Caustic 50/52 % ..... net	6	10	0	,,
	Caustic, White, 77 %..... ,,	10	10	0	,,
	,, ,, 70 %..... ,,	9	12	6	,,
	,, ,, 60 %..... ,,	8	12	6	,,
	,, Cream, 60 %..... ..... ,,	8	10	0	,,
	Crystals, in bags	8	0	0	,,
	,, barrels	8	7	6	,,
	Acetate ..... c.i.f. Hull net	16	15	0	,,
	Bicarbonate, in 1 cwt. kegs.....	6	15	0	,,
	Bichromate.....delivered England...	0	0	2¼	per lb.
	Chlorate ..... net	0	0	3 1/16	per lb.
	Nitrate...ex quay Liverpool, ... ,,	11	5	0	per ton.
	Phosphate	9	5	0	,,
	Prussiate .....net	0	0	3⅝	per lb.
	Silicate, Solution, 140° Tw.	4	10	0	per ton.
	Sulphate (Glauber Salts).....	1	12	6	,,
	,, (Saltcake, 95%).....	1	15	0	,,
Sulphur:	Recovered	4	15	0	,,
	Roll	6	15	0	,,
	Flowers.....	7	10	0	,,
Zinc:	Sulphate	6	15	0	,,
Shellac:	Standard TN orange spot	7	5	0	per cwt.

MINERALS.

Messrs. S. W. Royse and Co., quote:—

		£	s.	d.	
Barytes:	Lump Carbonate, 90/92%	3	10	0	per ton.
	Sulphate, No. 1, White	2	15	0	,,
China Clay:	of various qualities for all purposes; prices from about 11/- to about 30/- per ton, f.o.b. Cornwall: stocks also kept at Runcorn and Preston. Quotations given carriage paid.				
Chrome Ore:	Basis 50% c.i.f. British Ports.....	3	10	0	,,
Manganese:	Lump c.i.f. Liverpool 10½d.	per metallic unit.			
Ochre:	French JC ..... f.o.b. Rouen, net	2	5	0	per ton.
	,, JF	5	10	0	,,
Talc:	(French Chalk).....c.i.f. Liverpool	3	10	0	,,

Messrs. Henry Bath and Son, quote:—

	£	s.	d.		£	s.	d.	
Copper, Ores of, 10 to 25%	0	11	9	to	0	12	9	per unit.
Regulus, 45 to 55%.....	0	13	0	to	0	13	6	,,
Precipitate, 65 to 80% ...	0	13	1½	to	0	13	7½	,,
Tin Ores, 70 %.....	86	0	0	to	88	0	0	per ton.
Lead Ore, 70%					6	14	6	,,
Blende, 50%					6	13	6	,,
Calamine.....					6	16	0	,,
Antimony Ore, 50%.....	14	0	0	to	17	0	0	,,

Messrs. Barrington and Holt, Cartagena, quote:—

Iron Ore.

			s.	d.	
Ord. 50%, ...f.o.b.	Porman		6	3	per ton.
Do. ..... ,,	Cartagena		6	6	,,
Special low phos. ,,	Porman		6	10	,,
Do. do. ,,	Cartagena.....		7	0	,,
Extra quality do. ,,	,, ...		7	6	,,
Special Iron Ore ,,	,, ...	nominal			,,
Specular 58% do, ,,	,, ...		9	6	,,

TIMBER.

Messrs. Alfred Dobell and Co., Liverpool, quote:—

COLONIAL WOODS.

Timber.

		£	s.	d.		£	s.	d.
Quebec Square White Pine...	per cub. ft.	0	1	9	to	0	3	3
Quebec Waney Board Pine...	,,	0	2	8		0	3	9
St. John Pine, 18 in. average	,,	0	2	4		0	3	3
Lower Ports Pine.....	,,	0	1	3		0	1	8
Quebec Red Pine	,,	0	1	6		0	2	3
Quebec Oak, 1st quality	,,	0	2	9		0	3	4
Quebec Oak, 2nd quality ...	,,	0	1	6		0	2	6
Ash	,,	0	1	6		0	2	3
Elm	,,	0	3	3		0	4	0
Hickory	,,	0	2	0		0	2	6
Quebec Birch	,,	0	1	6		0	2	3
St. John Birch	,,	0	1	6		0	2	0
Birch Planks.....	,,	0	0	9		0	0	11
Spruce Spars	,,	0	0	10		0	1	0

Deals.

1st quality Quebec Pine	per std.	22	10	0	to	32	10	0
2nd do. do.	,,	17	0	0		22	0	0
3rd do. do.	,,	11	10	0		13	0	0
St. John, N.B., etc., Spruce	,,	7	10	0		7	15	0
Nova Scotia Spruce..	,,	7	0	0		7	10	0
Spruce Boards.....	,,	6	7	6		6	12	6

UNITED STATES, etc., WOODS.

Pitch Pine.

		£	s.	d.		£	s.	d.
Hewn	per cub. ft.	0	1	4	to	0	1	8
Sawn	,,	0	1	0		0	1	6
Planks, Stowage	,,	0	0	10		0	1	0
Boards, Prime	per std.	12	10	0		16	0	0
Oak Timber	per cub. ft.	0	1	6		0	2	6
Oak Planks	,,	0	1	6		0	2	1
East India Teak.....	per load	12	0	0		16	0	0
Greenheart.....	,,	6	15	0		7	10	0

EUROPEAN WOODS.

Timber.

		£	s.	d.		£	s.	d.
Riga Redwood	per cub. ft.	0	1	6	to	0	2	0
Dantzic and Memel Fir, Crown	,,	0	2	1		0	2	6
Dantzic and Memel Fir, Middling	,,	0	1	9		0	1	11
Stettin	,,	0	1	9		0	1	11
Swedish..... ...	,,	0	1	0		0	1	3
Riga Whitewood	,,	0	1	0		0	1	3
Norway Mining Timber	,,	0	0	9		0	1	0
Dantzic and Stettin, etc., Oak..	,,	0	2	6		0	3	0
Norway Spars.....	,,	0	1	2		0	1	9

Deals.

Red Archangel and Onega, 1st quality	per std	19	0	0		20	0	0
Red Archangel and Onega, 2nd quality	,,	14	0	0		16	0	0
Red Archangel and Onega, 3rd quality	,,	10	10	0		12	10	0
St. Petersburg, 1st quality...	,,	16	0	0		17	10	0
Do. 2nd ,, ...	,,	14	0	0		15	0	0
Gefle	,,	11	10	0		16	0	0
Wyburg	,,	11	0	0		12	10	0
Uleaborg	,,	10	0	0		12	10	0
Gothenburg	,,	11	0	0		16	0	0

SELECTED PATENTS.

Compiled expressly for this journal by **Messrs. Page and Rowlingson, Engineering Patent Agents, 28, New Bridge Street, London, E.C.,** and at Manchester.

Copies of Specifications may be obtained at the Patent Office Sale Branch, 25, Southampton Buildings, Chancery Lane, W.C., at the uniform price of 8d.

NEW PATENTS APPLIED FOR.

When Patents have been communicated the names of the communicators are printed in *italics*.

27050b/04. J. Hutchings, London. June 5th —Improvements in means and apparatus employed in generating motive power from waves, tides, or the like movements of water. (Date applied for, December 12th, 1904.)

27050c/04. J. Hutchings, London. June 5th.—Improvements in means and apparatus employed in generating motive power from waves, tides, or the like movements of water. (Date applied for, December 12th, 1904.)

11708. W. J. Greaves, London. June 5th. —Improvements in connection with furnaces.

11713. W. S. Hubbard, Leicester. June 5th — Improvements relating to draught-controlling apparatus for boiler and other furnaces.

11737. J. Hopkinson, Rochdale. June 5th. —An improved apparatus for lifting or raising shafts from their journals or bearings.

11754. W. Smethurst, London. June 5th. —An improved rotary engine.

11757. T. Waring, Liverpool. June 5th.— An improved machine for grinding and polishing screw propeller blades and other articles.

11764. F. G. Wright, W. H. Baines, and A. Thomson, London. June 5th.—Improvements in or relating to cocks and valves.

11787. S. Lake, London. June 5th.—Submarine boat with buoyant deck.

11788. S. Lake, London. June 5th.—Air-supply devices for submarine boats.

11789. S. Lake, London. June 5th.— Telescopic smoke-stacks for submarine boats.

11790. S. Lake, London. June 5th.—Water-ballast appliances for submarine boats.

11798. P. R. Lindsay and T. W. Blyth, Kirkcaldy. June 6th.—Steam turbine.

11826. J. F. Brady, London. June 6th.— Improvements in steam turbines.

11841. H. E. McLean, London. June 6th.— Improvements in governors for engines.

11844. J. I. Shirley, London. June 6th.— Improvements relating to distributing valves and valve gear.

11848. E. McLean, London. June 6th.— Improved method of, and apparatus for, regulating furnace draught.

11871. F. Pearn and S. Pearn, London. June 6th. — Improvements in connection with direct-acting steam pumps.

11874. Beyer, Peacock and Co., Ltd., and A. Hoy, London. June 6th.—Improvements in boilers.

11833. The Pulsometer Engineering Co., Ltd., and R. Newcomb, London. June 6th.— Improvements in direct steam pressure pumps.

11906. A. Johnson and R. Walters, Griffithstown. June 7th.—An improved plug for defective tubes in steam boilers.

11918. C. Tuckfield and W. G. de Forgés Garland, East Molesey. June 7th.—Reversible propeller.

11920. C. H. Lewis and J. Smith, Birmingham. June 7th.—Improvements in adjustable exhausts for locomotives.

11960. L. Murphy, Liverpool. June 7th.— Improvements in metallic packings for turbines and other rotary engines.

12002. Clayton and Shuttleworth, Ltd., and J. E. Birkin, Lincoln. June 8th.—Improvements in boiler furnaces.

12040. F. von Tresckow, London. June 8th. — Improvements in, and connected with, axle bearings. (Date applied for, June 9th, 1904.)

12051. H. E. Fry, London. June 9th.— Improvements in methods and apparatus for producing and utilising electricity and steam-power.

12073. W. Weir, London. June 9th. — Improvements in valve guards.

12078. W. Fairweather, London. June 9th.—Improvements in steam generators. (*C. W. Forbes, U.S.A.*)

12086. J. Hopkinson and J. Hopkinson and Co., Ltd., London. June 9th.—Improvements in stop valves.

12138. H. E. Lupton and W. Calvert, Accrington. June 10th.—Improvements in valves.

12139. E. Ramsbottom, Heywood. June 10th.—Improvements in the seven-flued type of boilers.

12158. N. Dakin, Leeds. June 10th.—Improved valve gear for direct-acting feed pumps and the like.

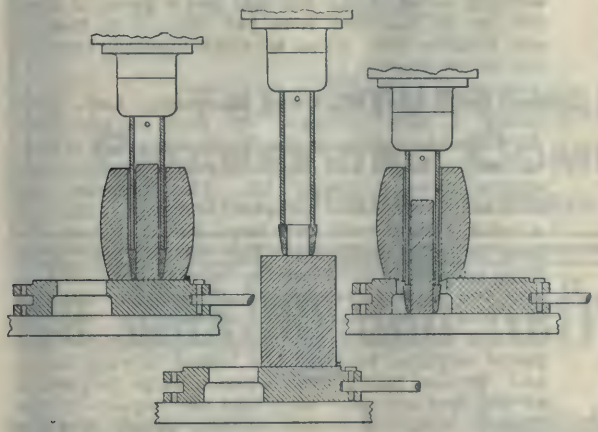
12175. A. Bode and K. Bottcher, London. June 10th.—Improvements in or relating to floating cranes and the like.

RECENT SPECIFICATIONS.

IMPROVEMENTS IN METHODS OF AND MEANS FOR PUNCHING HOLES THROUGH INGOTS OR OTHER SOLID MASSES OF METAL.

Sir W. G. Armstrong, Whitworth and Co., Ltd., Newcastle-on-Tyne. May 11th, 1905.—This invention relates to an improved method of punching holes of any required shape in ingots or other

FIG. 2. FIG. 1. FIG. 3.

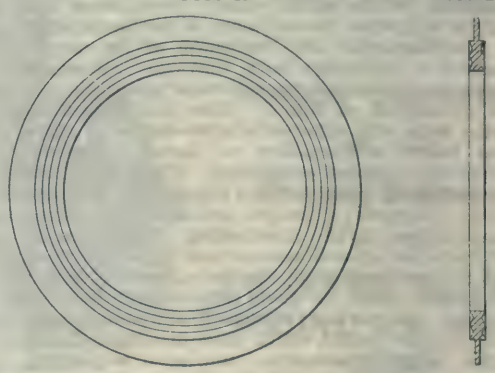


solid masses of metal, when it is required to remove the central part of the ingot. The punch is made of a shaped piece of metal, preferably chilled cast iron, with an internal hole of the same size and shape as the "core" to be punched out, the hole being slightly tapered from the point or forward end, to allow the "core" a free passage through the punch. The bolster for punching on consists of a metal block with a flat surface upon one end, and at the other end having a hole of slightly larger diameter than the punch to be used; the thickness of this block being rather greater than the length of the taper part of the punch. The method of operating is as follows: The ingot or piece of metal to be punched is heated and placed upon the flat surface of the block. The block with the ingot upon it is then moved under the ram of a hydraulic press carrying the punch; the punch is then forced through the ingot until the point comes in contact with the flat surface of the block. The pressure is then removed and the ingot retained in its place under the press ram, but the block upon which the ingot rests is moved endways until the centre of the punch coincides with the centre of the hole in the block; the pressure is then again applied and the punch driven right through. The operation is then complete, the ingot having in it a hole of the same diameter as the external diameter of the punch, while a "core" of the same diameter as the hole in the punch is cut clean through. Drawings show vertical sections of the appliance, and in fig. 1 the ingot is shown resting on the solid portion of the bolster and the punch ready to be forced down. In fig. 2 the punch is shown to have been forced through the ingot until it has been brought down to the bolster. Fig. 3 shows the bolster to have been shifted endwise, so that the hole formed through it has been brought below the ingot and the punch forced through. A chain or other stop, by which the lower end of ingot can be prevented from moving whilst the bolster is being shifted from position shown in fig. 2 to that in fig. 3, is provided. The exterior of punch head is made slightly conical, so that the top is of slightly larger diameter than at the bottom or forward end, which end is rounded or bevelled off on its outer side so that the metal displaced by punch is forced outwards in a radial direction away from the hole that is being punched.

IMPROVEMENTS IN METAL PACKING FOR FLANGE AND OTHER JOINTS.

P. Hulburd, Leadenhall Street. May 11th, 1905.—This invention relates to metal packing used in making flange and other joints, and consists in providing the jointing or packing with a fin or extension which is part of the packing itself and made out of the same material. It is found in practice that the usual extension piece sometimes becomes detached and allows of the packing shifting; furthermore the said extension pieces are difficult of application and are not suitable for packings for rectangular or irregularly shaped joints, and the object of the invention is to overcome these objections. By reference to the drawings the invention will be readily understood. Fig. 1 is an elevation of a packing ring provided with the improved extension fin, and fig. 2 is a median section at right angles to the plane of the ring. These figures show the packing proper, which is composed of copper or other metal of sufficient ductility, and the fin or extension made in accordance with the present invention. This fin or extension is most successful in keeping the packing in its exact position, and being of the same material as the packing, expands and contracts with it, whilst it obviates the liability of breakage or damage due to the pressure of the bolts or the necessity for cutting away to allow of sufficient clearance. It will be understood that, although the drawing shows a ring-

FIG. 1. FIG. 2.



shaped piece of packing, the packing provided with the improvement may be made of square, oval, triangular, or other desirable shape.

NEW PUBLICATIONS.

"MODERN ELECTRICITY."

A Practical Working Encyclopædia and Manual of Theories, Principles and Applications. By J. Henry and K. J. Hora. Hodder and Stoughton. 5s. net.

The student of electrical engineering will doubtless find this work of much practical value in cases of emergency; the arrangement for speedy reference is all that could be desired. Each formula is explained in the clearest manner possible and the processes of arriving at results are mathematically demonstrated. The work, which is of American origin, would have been much improved by a further revision before placing it in the hands of English readers. We have been unable to find any reference to the Board of Trade electrical standards, and the inclusion of such information as this is almost essential in a work of this nature.

"THE CRYSTALLISATION OF IRON AND STEEL."

By J. W. Mellor, D.Sc. Longmans, Green and Co. 5s. net.

This most interesting introduction to the study a metallography is the outcome of a series of lectures delivered by the writer before classes of engineering students. The work is divided into six parts, dealing successively with, the solidification and cooling of alloys; the constituents of iron and steel, the hardening, annealing and tempering of steel; the crystallisation of iron and steel; the influence of stress and strain, and how to prepare a specimen for the microscope. As an appendix is given a glossary of terms based upon the report on the nomenclature of metallography drawn up by the Iron and Steel Institute. Altogether the volume is a valuable addition to technical literature and one capable of further expansion. A collection of excellent photographs is included, giving the reader a comprehensive idea of the internal structure of metals and their alloys.

"ELECTRO-MAGNETIC THEORY OF LIGHT."

By Charles Emerson Curry, Ph.D. Part I. Macmillan and Co. 12s. net.

Judging by the first part, Dr. Curry's treatise bids fair to become recognised as a standard work. He informs us that he has endeavoured to account for the manifold phenomena of light as electro-magnetic phenomena, deriving the same from the fundamental differential equations for electro-magnetic disturbances. In the treatment of the subject-matter more stress has been laid on a rigorous development of the fundamental laws of optics than on the derivation of the many consequences or secondary laws, that can be deduced from the former by familiar principles and have little to do with the conception of light. After the introduction the writer deals with spherical electro-magnetic waves, etc.; then follows a discussion on linearly, circularly and elliptically polarised oscillations. Chapter IV. is devoted to interference phenomena of the primary and secondary waves; Huygen's principle and diffraction then receive consideration. The concluding chapters deal with reflection and refraction on surface of isotropic insulators, and the propagation of electro-magnetic waves through crystalline media, covering reflection and double refraction on the surface of biaxal and uniaxal crystals. Each chapter opens with a brief historical sketch of the matter under consideration, and, as far as possible, each section is complete in itself. It is quite obvious that the author has been persistently painstaking in carrying out his arduous task.

NEW CATALOGUES.

Messrs. Charles Winn and Co., of Birmingham, are drawing attention to their boiler mountings and fire appliances by means of a novel series of post cards.

The Fairbanks Company, of 78–80, City-road, E.C., post us a leaflet on the subject of their automatic chain brand solid steel grease cups. These are manufactured in six sizes, being adapted for stationary or movable bearings owing to there being a continuous pressure on the lubricant at all times, forcing it down on the bearing. The outlet through the shank is provided with a plug to regulate the quantity.

The C. W Hunt Company, of New York, send us a well-illustrated pamphlet on coal-handling machinery for power stations, boiler rooms, coaling stations, gas companies, coal yards, docks, manufactories, etc. Prominence is given to the firm's parabolic boom tower for handling steam shovels. This is a one-man tower and is especially adapted for economically hoisting coal from vessels. It is claimed that the cost per ton handled both in the labour expense in hoisting and also in the repair and general maintenance of the plant is less than any other style of hoisting gear yet devised. Three sizes have been made—one-half ton, one ton, and two tons capacity of the shovel. The ordinary working speed of the one-ton size is given at from five to six hundred tons per day. The two-ton size handles from seven to eight hundred tons per day of ten hours.

James Keith and Blackman Company, Ltd., have issued a new catalogue of their electric fans. An account is given of the Keith-Blackman system of electric motor and blower combined for blowing smiths' fires, furnaces, etc. This premises the statement that the present system of arranging a smith's shop with one large blower for all the fires is very inefficient. The blower has to be large enough to blow all the fires at once, and to give the highest pressure required at any time on any fire, with additional pressure for blowing through a length of air pipe. In consequence the power required to drive the blower is very heavy and remains heavy even when a large proportion of the fires are shut off; also any repairs to the blower, motor, or engine driving means shutting down the entire shop. To meet these and other objections Messrs. James Keith and Blackman Company have designed and placed on the market a small blower and motor combined in one piece for fitting direct to the tuyers of each forge. The following advantages among others are claimed: The power required is very small, being from 100 watts for light work to 300 watts for heavy work, and as no power is used when the fire is not being blown, the average power will be from 50 per cent. to 33 per cent. of above. The blast being started, stopped and controlled by a switch, is under much better control than when regulated by a valve. Every fire is independent, and repairs can be effected without stopping the general work. There is a saving in cost, space and power, due to there being no air pipe or trench to carry it. The first cost will in most cases come out less than the old system, but even if the first cost did exceed the cost of the old system, it will be compensated for by a saving of from 50 per cent. to 70 per cent. of the power which the old system would use.

PAGE'S WEEKLY

Miscellaneous

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MEANS

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WE OFFER
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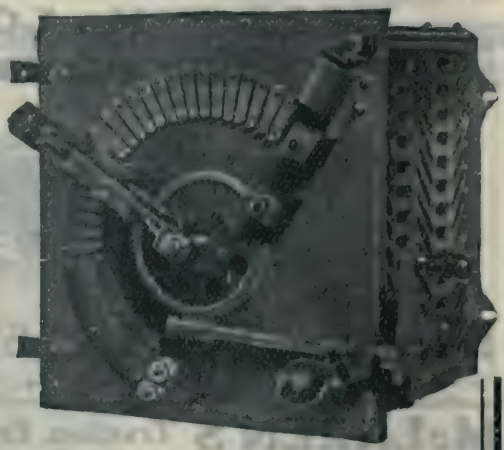

Fig. 2.
Starting Rheostat, with Worm Slow Speed Gear and with Cover removed, showing Worm Gear.

THE STURTEVANT ENGINEERING COMPANY, LTD.,
147, QUEEN VICTORIA ST., E.C.

SEE LEAFLET P.M. 10 S

Ice Making and Refrigerating Machinery.

CARBONIC ANHYDRIDE (CO_2).

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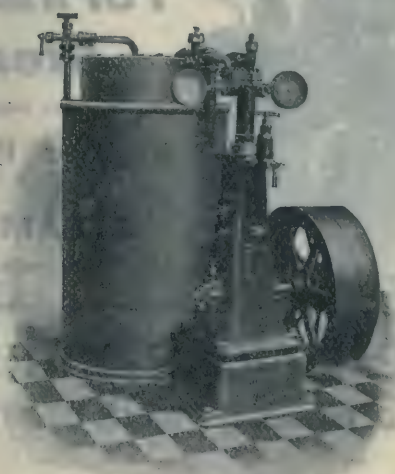

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TELEGRAMS: "COPPERWORM."
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Contractors H.M. to Government, War Department, and India Office.

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Miscellaneous

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Mine, Furnace and Industrial Locomotives.

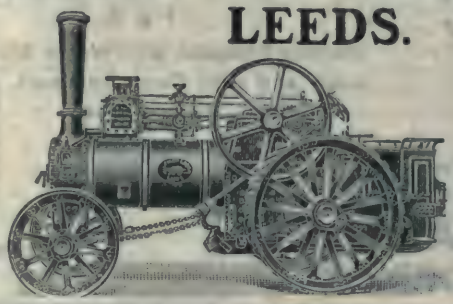
Electric Locomotives with Westinghouse Motors and Electric Trucks.

Burnham, Williams & Co., Philadelphia, Pa., U.S.A.

Cable Addresses: "Baldwin, Philadelphia"; "Sanders, London." General Agents: SANDERS & CO., 110, Cannon St., London, E.C.

McLAREN'S Traction Engines, LEEDS.

Cable Address: "McLAREN, LEEDS."
Codes used: A B C 4th and 5th Editions. LIEBER'S.



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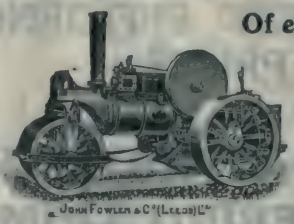

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JOHN FOWLER & CO. (Leeds), LTD.

Steam Plough Works, LEEDS.
Telegraphic Address: "FOWLER, LEEDS." Telephone No.: 513

This illustration is of a Steam Wagon to carry 6 Tons and haul 4 Tons on a Trailer.

THE . . Yorkshire Patent Steam Wagon Co.

(Branch of Deighton's Patent Flue and Tube Company, Ltd.),

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To suit any trade purpose, and to carry 3, 4, 5, and 6 tons.
Full particulars on application.

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Every Description of FIRE-CLAY GOODS. *STOCK UNEQUALLED.*

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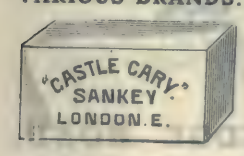

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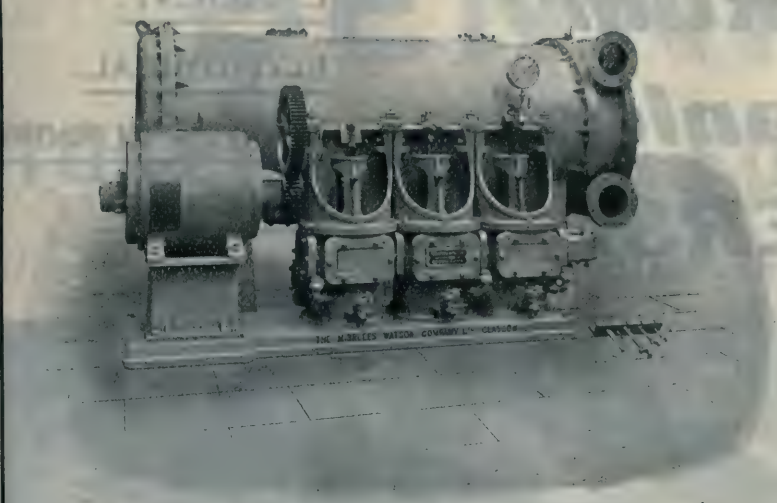
J. H. SANKEY & SON, Ltd., Head Office, Essex Wharf, CANNING TOWN, E

ESTABLISHED 1857. (Contractors to H.M. Government.



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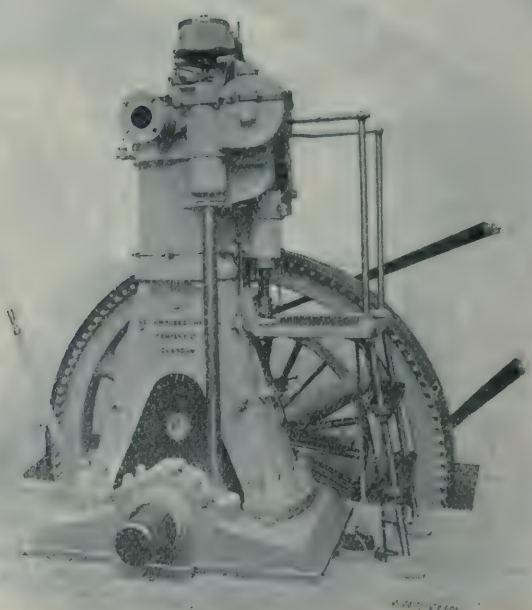

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Forced Draught for Boilers.

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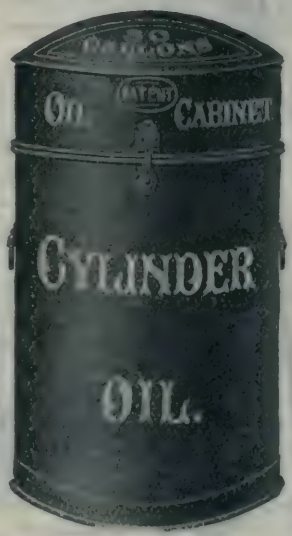
No Engine Room should be without a Cabinet.

Stock sizes 6 to 100 gallons capacity.

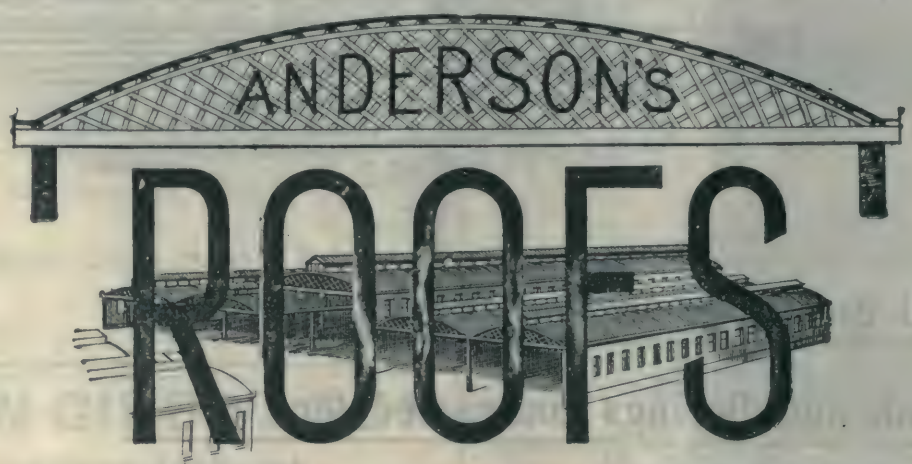


Patent "Waste Oil" Filters.

Made in several types.

To filter from 2 gallons per week to 90 gallons per day.

THE VALOR COMPANY, Ltd., ROCKY LANE, ASTON CROSS, **BIRMINGHAM.**



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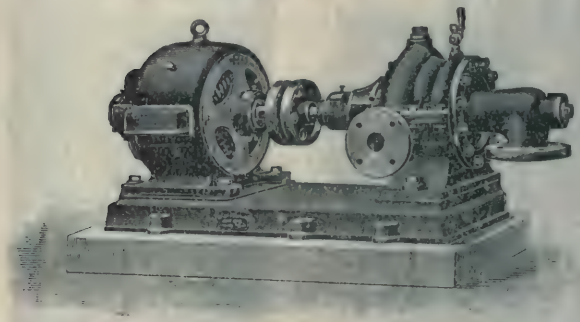

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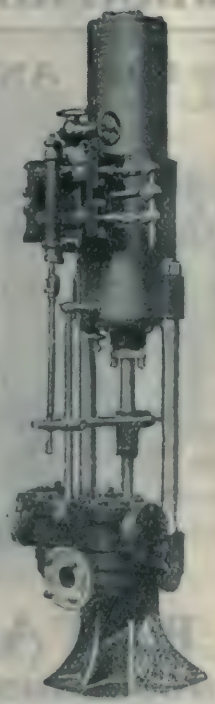
WEISE & MONSKI,
HALLE, O.S. (Germany).

J. P. HALL & SONS, Ltd.,
ENGINEERS,
PETERBOROUGH.



We make a SPECIAL Compound Direct Acting Slow Running

Boiler Feed Pump

ECONOMICAL AND EFFICIENT.

We deliver 100 lbs. of Water for the expenditure of 1 lb. of Steam. This with our 2,000 gallon Pump, and a much higher efficiency as the size of the Pump increases.

AN IDEAL PUMP FOR GENERAL BOILER FEEDING PURPOSES.

APPLY FOR PARTICULARS.

The "Little Giant" Turbine.

HORIZONTAL AND VERTICAL.

Specially adapted for Electric Light and Power Transmission Purposes.

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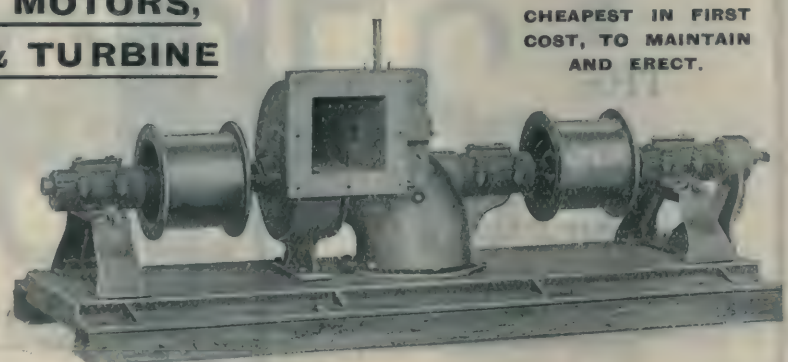
CHEAPEST IN FIRST COST, TO MAINTAIN AND ERECT.



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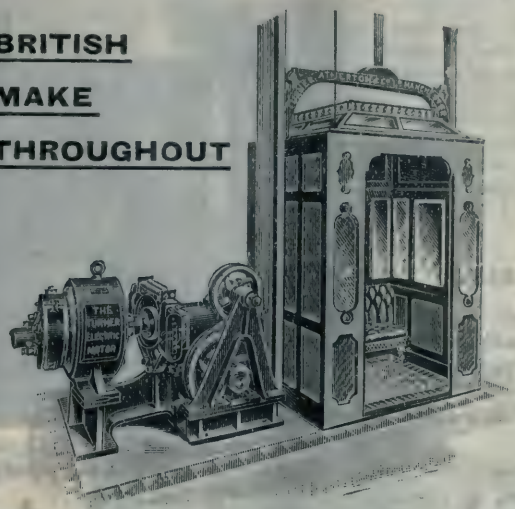
BRITISH MAKE THROUGHOUT



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Reliable, Durable, and of Simple Mechanical Construction.

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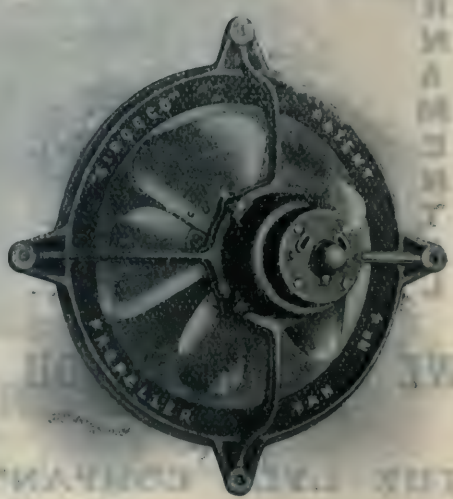
"SIROCCO" FANS

Propeller Type.

ELECTRIC OR BELT-DRIVEN.

The design and arrangement of the blades are such that the **"Sirocco"** Propeller Fan **will propel air** with equal efficiency, **either outwardly** or **inwardly**, according to the direction of the rotation.



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Dealing with Correspondence.

FIRST: Copy your letters, agreements, and other outgoing correspondence on the **Shannon Letter Copier**, which copies ten times as quickly as an ordinary screw press.

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THE RESULT:

Perfect Copies. Instant reference to outgoing and incoming correspondence. Great saving of time, worry, and hard cash.

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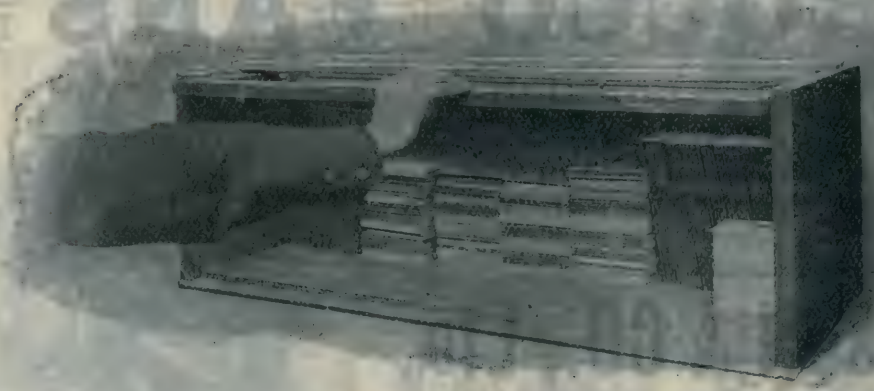

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AND

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SHORTEST SEA PASSAGE

(ONLY ABOUT SIXTY MINUTES).

FIVE QUICK SERVICES DAILY, as under:—

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	For Intermediate Stations ...	6.5 p.m.	†* 9.50 a.m.	For CALAIS only	
† 11.0 a.m. from	Victoria Station	6.45 p.m.	†* 11.35 a.m.		6.45 p.m. Victoria Station
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Depart. from London.		Arrival in Paris.	Depart. from Paris.		Arrival in London.
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Mail Route *via* Dover and Ostend.

Three Express Services Daily in Each Direction.

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Two Services Daily in Each Direction.

For Full Particulars see S.E. & C.R. Continental Time Tables, price 3d. VINCENT W. HILL, *General Manager.*

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PAGE'S WEEKLY — Miscellaneous

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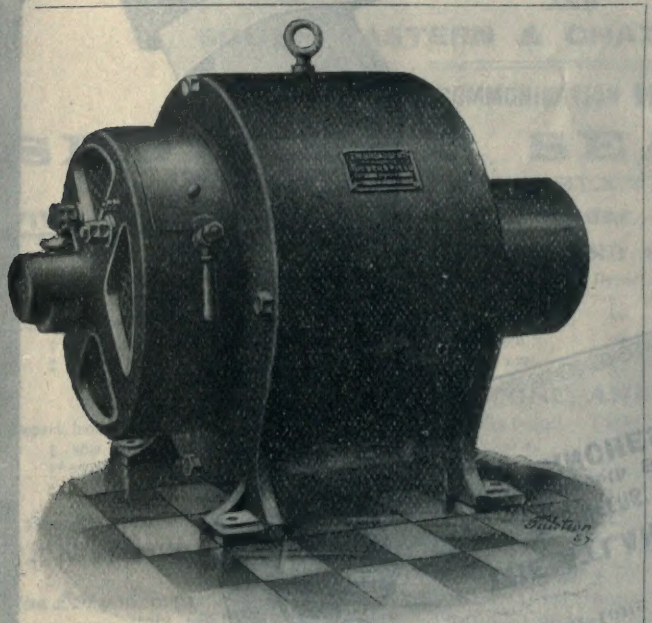

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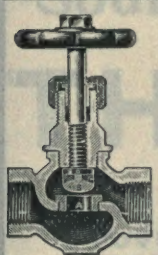
Specialities:

DYNAMOS,
MOTORS,
SWITCHBOARDS.

The "SHAW" Patent Steam Valves . .



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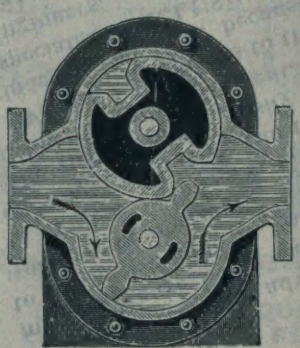

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THE . . .

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POSITIVE ACTION.
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HIGH EFFICIENCY.

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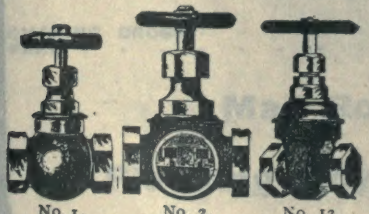

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VALVES ALL TYPES. LIBERAL DISCOUNT.

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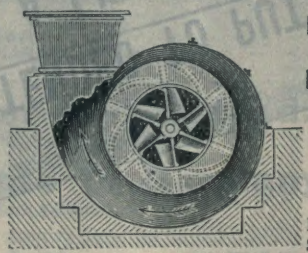

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Induced & Forced Draught Fans.

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